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The Economic Values to Society and Landowners of Wildlife in San Joaquin Valley Agroforestry Plantations

November
1988

prepared under contract for the
FEDERAL-STATE
SAN JOAQUIN VALLEY DRAINAGE PROGRAM
prepared by
CALIFORNIA DEPARTMENT
OF FOOD AND AGRICULTURE
and UNIVERSITY OF CALIFORNIA, DAVIS

This report presents the results of a study conducted for the Federal-State Interagency San Joaquin Valley Drainage Program. The purpose of the report is to provide the Drainage Program agencies with information for consideration in developing alternatives for agricultural drainage water management. Publication of any findings or recommendations in this report should not be construed as representing the concurrence of the Program agencies. Also, mention of trade names or commercial products does not constitute agency endorsement or recommendation.

The San Joaquin Valley Drainage Program was established in mid-1984 as a cooperative effort of the U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, U.S. Geological Survey, California Department of Fish and Game, and California Department of Water Resources. The purposes of the Program are to investigate the problems associated with the drainage of irrigated agricultural lands in the San Joaquin Valley and to formulate, evaluate, and recommend alternatives for the immediate and long-term management of those problems. Consistent with these purposes, Program objectives address the following key areas: (1) Public health, (2) surface- and ground-water resources, (3) agricultural productivity, and (4) fish and wildlife resources.

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EXECUTIVE SUMMARY

Agroforestry plantations (woodlots containing deep rooted, salt tolerant trees and shrubs) have been proposed as a partial solution to some of the agricultural drainage related problems of the San Joaquin Valley. Trees being planted in the valley are primarily fast growing, exotic, salt tolerant phreatopyhtes. These groves of trees and shrubs appear to create wildlife havens on the otherwise nearly treeless Valley floor (Dyer and Chesemore, 1988). Because some of the subsurface groundwater on which these trees thrive is laced with toxic trace elements (some of which can concentrate and biomagnify), there is concern that such groves could also pose a threat to valley wildlife. A study funded by the Federal - State San Joaquin Valley Drainage Program (SJVDP) is currently underway to determine if agroforestry plantations in the Valley will be a boon or an attractive nuisance for wildlife.

Wildlife species have a variety of values, some of which can be measured in economic terms. They have ecological values for other species of animals and plants, and the communities in which they dwell. They also have ecological and economic values for both farmers who own woodlots and society at large. This study was conducted to determine if such economic values could be determined through review of extant literature and interviews with individuals currently working on related topics.

The literature review involved finding any studies relating to the topics of wildlife values in California, the Central Valley and, especially, the San Joaquin Valley, and the economic values of upland game bird hunting, waterfowl hunting, and birdwatching in California. Unfortunately, when the geographic range of the search categories was limited to topics related to California, only a few published studies of any relevance were found. Suitable studies on California are, for the most part, limited to those conducted by the California Department of Fish and Game. Outside of the material compiled by that department, four studies for California were found. In addition to the relevant studies dealing with California, a number of studies addressing these subjects on data from outside California have been done.

Using the results gathered from the studies presented in this report, one can approximate the economic benefits from the current amount of wildlife recreation on the floor of the San Joaquin Valley. The following benefits, or values, while important, do not capture all of the economic value of wildlife. All the studies done thus far have concerned only on-site (both consumptive and nonconsumptive, such as birdwatching) recreational use values of wildlife. Other wildlife values include off-site values such as option, existence, and bequest values (defined in Purposes section, Chapter 1). Besides these off-site user-values, there may exist intrinsic or ecological values associated with the wildlife resources that may not have human payoffs. In this report on-site recreational use values for wildlife were estimated for the categories of small game, upland game birds, and waterfowl. The economic benefit of bird viewing is also estimated. Total

economic benefits for recreation are defined as the total number of hunter (or viewer) days in the San Joaquin Valley times the value per hunter (or viewer days) in the valley.

Total hunter days in the San Joaquin Valley for the small game and upland game bird categories for the 1985 season are 243,334 and 456,925 days, respectively. The average total value per hunter day for small game and upland game bird hunting was found to be $31.22. The resulting total annual values for these two categories for the San Joaquin Valley are approximately $7.6 million and $14.3 million, respectively.

For the waterfowl category, the value per hunter day for the San Joaquin Valley refuges is $62.00. The total number of waterfowl hunting days in the San Joaquin Valley is 265,727, and hence, the total annual value of waterfowl hunting is $16.5 million.

In 1987, the total number of recreational trips to the 8 San Joaquin Valley counties on which wild birds were seen is 1,733,820. Using close-ended Contingent Valuation questions, the total value per trip on which wild birds were seen is estimated to be $37.33. The total annual value for bird viewing in the San Joaquin Valley is approximately $64.7 million.

In the San Joaquin Valley, hunter bag and hunter days are highest, on average for the upland game category.

In a study that is still in progress, estimates of net willingness to pay (consumer surplus) for waterfowl hunting in California's San Joaquin Valley National Wildlife Refuges for the 1987 season have been calculated. Preliminary research suggests that the average value of consumer surplus per hunter-day for all the sites is $62.00. The average value for the seven SJV sites studied is $55.41. In the October 1987 thru January 1988 hunting season, 27,603 hunters went to these seven refuges. The total consumer surplus for each of the seven sites is the product of that site's consumer surplus per hunter-day and the total number of hunters who went to the site. The sum of the total consumer surplus across all these seven sites is $1.6 million.

In 1987, for the San Joaquin Valley counties of Fresno, Merced, and San Joaquin (the only SJV counties for which this data is available), 213,213 recreational trips for the primary purpose of viewing birds were taken. Sightseeing is the major nonconsumptive use in California State-owned or operated waterfowl areas.

In a separate study which used open-ended Contingent Valuation Method questions, the authors found that a person's total willingness to pay for a recreational trip in which wild birds were seen was $24.61 for California, and was $28.67 for a recreation trip for the primary purpose of viewing wild birds. Another finding was that each person that sees an additional bird has his or her trip's enjoyment increased by approximately $0.50 per additional bird seen up to a 50 percent increase and then about $0.20 more per bird up to double the population of birds.

A survey of 56 ranchers in California that lease land for the purpose of deer hunting found that they had an average profit of $1.40 per acre on wildlife operations. Statistical analyses of the 56 hunt club (ranch) returns indicate that the harvest success rate and the percentage of the harvest that are trophies are the key contributors to higher hunting lease revenue per acre. It appears that hunting related services such as cabins, food, or even guide services are not consistently significant revenue enhancers. These factors may influence whether or not a hunter selects that particular farm or ranch to hunt, but not the amount of revenue received.

CHAPTER ONE. INTRODUCTION

Agroforestry plantations (woodlots containing deep rooted, salt tolerant trees and shrubs) have been proposed as a partial solution to some of the agricultural drainage related problems of the San Joaquin Valley. Those problems include: shallow and very saline groundwater beneath hundreds of thousands of acres of irrigated agricultural lands reducing present and threatening future crop production: and, adverse effects upon water quality, fish and wildlife, and potentially, upon public health due to toxic trace elements in subsurface drainwater from such waterlogged farmlands when it mixes with potable groundwater supplies or is dumped into freshwater streams, rivers, or open ponds.

Trees being planted in the valley are primarily fast growing, exotic, salt tolerant phreatopyhtes. A number of species of the genus Eucalyptus are by far the most common trees planted to date. Despite their exotic origins, groves of eucalyptus trees appear to create wildlife havens on the otherwise nearly treeless Valley floor. Because some of the subsurface groundwater on which these trees thrive is laced with toxic trace elements (some of which can concentrate and biomagnify), there is concern that such groves could also pose a threat to valley wildlife. A study funded by the Federal - State San Joaquin Valley Drainage Program (SJVDP) is currently underway to determine if agroforestry plantations in the valley will be a boon or an attractive nuisance for wildlife.

Preliminary findings from the agroforestry - wildlife study clearly show that great numbers of certain wildlife species use the woodlots. These include game species (e.g., mourning doves, ringnecked pheasants, blacktailed jackrabbits, desert cottontails, american coot, etc.) and a variety of species (e.g., several raptor species, wading and shore birds, a wide variety of songbirds, and possibly some large mammals such as foxes and coyotes) of special interest to people who enjoy wildlife observation (Dyer and Chesemore, 1988).

Such wildlife species have a variety of values, some of which can be measured in economic terms. They have ecological values for other species of animals and plants, and the communities in which they dwell. They also have ecological and economic values for both farmers who own woodlots and society at large.

PURPOSES OF THE STUDY

The purpose of this study is to define the existing and potential economic values to both landowners and society at large of wildlife associated with agroforestry plantations in the San Joaquin Valley. Specifically, this study answers the following questions: 1) What are the economic values to society resulting from new or increased wildlife populations benefitting from agroforestry plantations in the San Joaquin Valley? 2) What are the financial values to landowners resulting from those same wildlife populations? What net economic return could a landowner expect from management of such agroforestry plantations to reap income related to human uses (both consumptive and nonconsumptive) of associated wildlife populations? 3) How do specific wildlife species; wildlife species diversity; wildlife abundance; provision of certain facilities, services, or other management of human uses of wildlife; or, other variables affect economic values or potential landowner income?

Because the wildlife species associated with agroforestry plantations in the San Joaquin Valley (SJV) are largely non-market environmental resources, the economic values of the wildlife is not readily apparent. A non-market good, as opposed to a market good, is one which is not readily traded on the open market. The dollar value of a market good, a packaged frozen fryer for example, is readily determined: it is the dollar value - determined through the interaction of the forces of supply and demand - stamped on the good in the local grocery store. On the other hand, a waterfowl bagged in a SJV wildlife refuge is a non-market good. The payment the hunter must make for it is the cost of the hunting application. This payment, or fee, is administratively set by the government, frequently with little consideration for the interaction of supply and demand for the animal. Hence, the fee is not a market-clearing price (i.e. the price at which the supply equals the demand for the good). To make an estimate of what the market-clearing price would be if there was a market for the good, some sort of non-market resource valuation techniques are needed. Possible techniques, such as the Hedonic Price Approach, the Contingent Valuation Method, and the Travel Cost Method, are discussed in the Methods section of Chapter 3 of this report.

Beside the citizens' economic values of on-site recreation (both consumptive, such as waterfowl hunting, and nonconsumptive, such as bird watching) and commercial uses of wildlife, there are many off-site user values. These include option, existence, and bequest values. Option value can be thought of as an insurance premium people would pay to insure availability of wildlife recreation opportunities in the future. Existence value is the economic benefit received from simply knowing wildlife exist. Bequest value is the willingness to pay for providing wildlife resources to future generations. While option and existence values may be present for manufactured consumer goods that have a market, Randall and Stoll (1983) claim those values are likely to be, at the margin, empirically insignificant in size compared with certain scarce wildlife species. These off-site values can be estimated through survey techniques such as the

Contingent Valuation Method.

Figure 1 illustrates a hypothetical framework for the allocation of the total value of wildlife among the various on and off-site user values. The financial value of wildlife shown in the pie chart reflects a *portion* of the social benefits (defined in terms of willingness to pay) of the recreational and commercial uses of wildlife. Financial values, which are less general than the economic values that include all of the values mentioned above, reflect only revenue or sales received by firms or public agencies (i.e., cash changing hands). This report presents values for the commercial, financial, and recreational categories. No California wildlife studies have yet been done to determine the other values.

Besides these off-site user-values, there may exist intrinsic or ecological values associated with the wildlife resources that may not have human payoffs. An examples of these values may be the well-being the wildlife derives from living in a healthy habitat. But unless these intrinsic or ecological values have a human payoff or are valued from a human perspective, as in option, existence, or bequest values, they obviously cannot be measured in terms of dollars and are thus beyond the scope of this economics-based report.

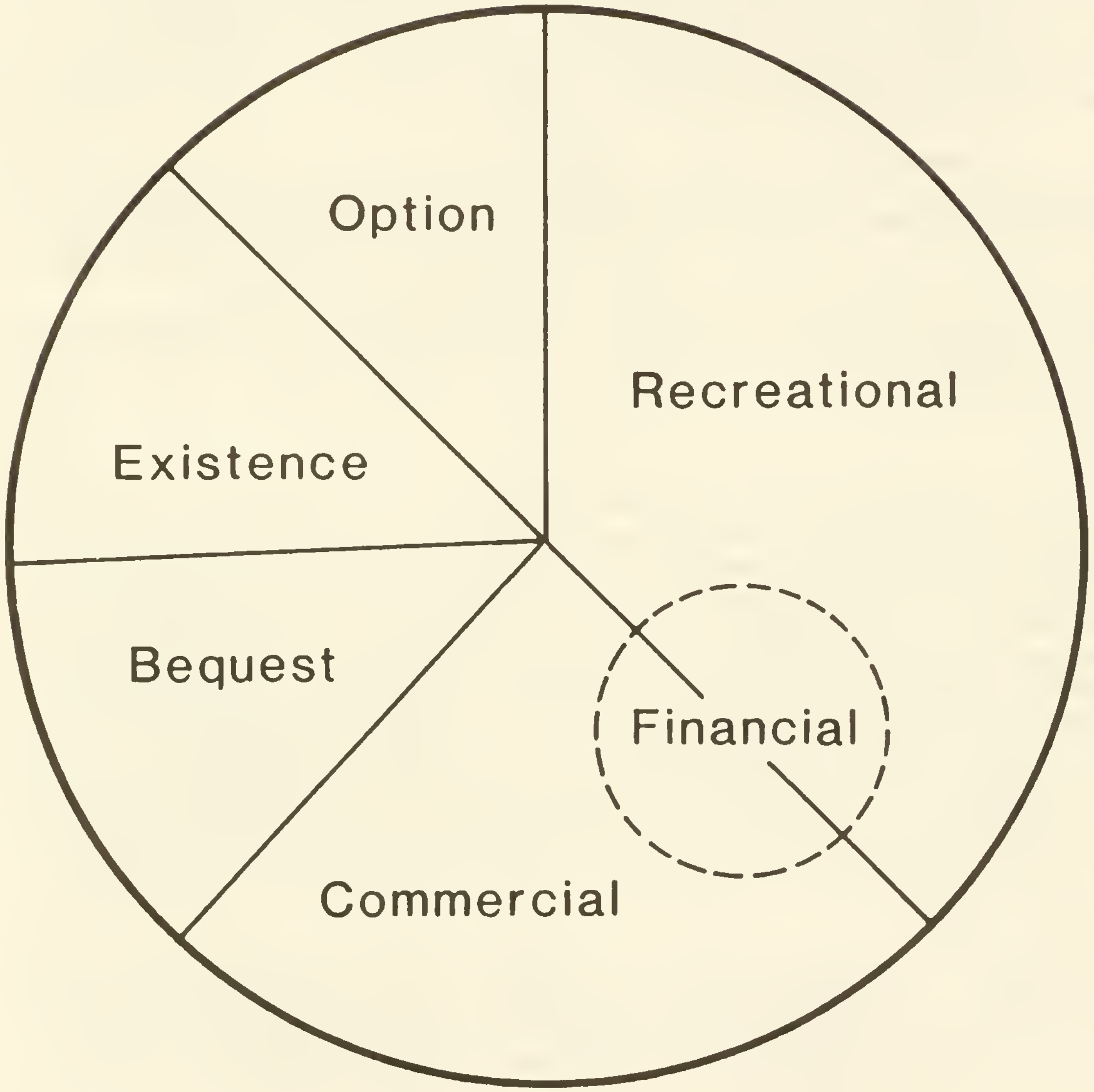
METHODS

This study is the first of what may be two phases. The first phase involves review of extant literature and discussions with fish and game managers as well as researchers to determine what is currently known about economic values of the species of wildlife of interest, in the setting we are concerned with, and development of written findings. As will be discussed in more detail below, a literature search with computer assistance was performed. Interviews with experts in government agencies, universities, and private organizations were conducted using a "snowball" interview approach (i.e., first a known authority in the field of interest is contacted regarding relevant research and data and for the names of other potential sources of information, who then ideally supply more information and more potential sources of research and data). Appendix A includes a list of persons contacted who supplied material for this study. Appendix B is a bibliography.

Also part of the first phase, is the development of specific recommendations and methodologies for further study to gather any additional information necessary to answer the questions listed above. Such recommendations would be accomplished with methods to be employed in further studies.

Based upon the findings and any recommendations resulting from this first phase effort, and upon available funding, a second phase may be undertaken. That phase would entail the conduct of original work to gather data necessary to define currently unknown economic values of wildlife in Valley agroforestry sites.

Figure 1. Framework for the Allocation of the Total Value of Wildlife

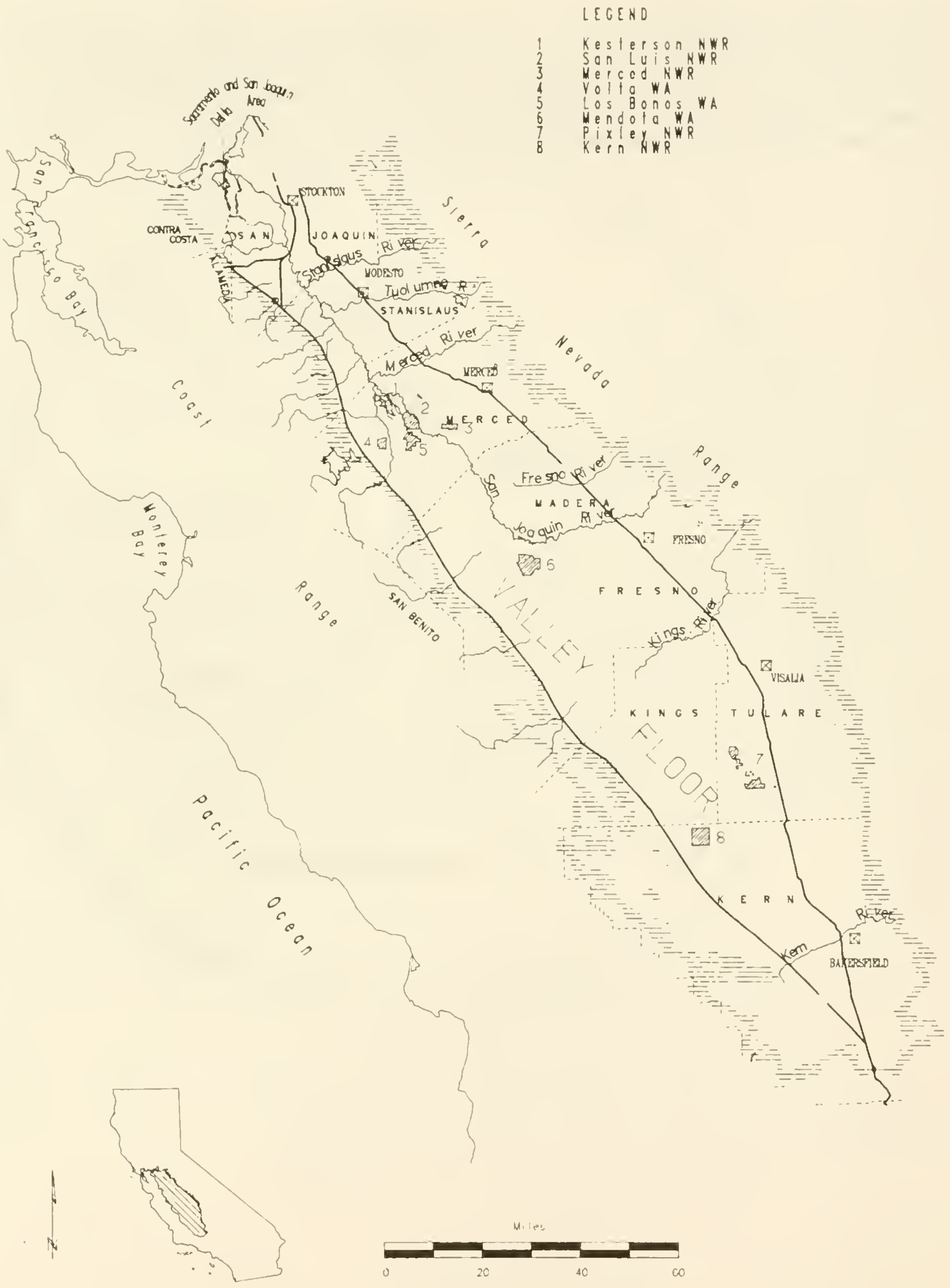


STUDY AREA.

The geographic study area of this report encompasses, in north to south order, San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern Counties. These counties span the central California region known as the San Joaquin Valley. When deemed useful for comparative purposes, counties outside the core San Joaquin Valley region are included. Figure 2 is a map featuring the geographic study area of this report.

Study Area Map

Figure 2



CHAPTER TWO. USE DATA

A. HUNTING STATISTICS FOR THE SAN JOAQUIN VALLEY

Figures 3 thru 10 present hunting statistics by types of game species for California counties in the San Joaquin Valley for the years 1983 thru 1985. The hunting game are divided into three categories, which together encompass the major species hunted in these areas: (1) **Upland Game Birds** is the summation of dove, pheasant, and quail; (2) **Small Game** is comprised of squirrel, cottontail, and jack rabbit; and (3) **Waterfowl** consists of ducks, geese, and coots. Those species chosen for each category represent the major species in terms of number bagged in the San Joaquin Valley counties for that category. For each of these three categories, the total bag and the total number of hunting days per county per year are presented. Figures 3 thru 10 exhibit the data for San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern Counties, respectively.

The data displayed here were procured from the California Department of Fish and Game's annual Report of the Game Take Hunter Survey. The survey does not present data on the species hunted by breed (e.g. no distinction is made between the mallard and pintail duck breeds). Years prior to 1983 are not included here as the reports for the years prior to 1983 do not present the hunter days by county.

In the figures, the vertical axis represents the total levels of bag and hunter days. Hunter bag and days for the 3 categories are presented horizontally across the page and the three years of data are stacked one behind the other. As is evident from the figures, hunter bag and hunter days are highest, on average for the upland game category. For Merced County though, which does contain the greatest remnant acreage of wetlands in the state (specifically in the Grassland Water District), bag and days are highest in the waterfowl category. Although the graphs exhibit a great deal of variability, hunter bag and hunter days have been declining over the last few years.

Appendix C contains the detailed tables by individual species on harvest and hunter days by county.

Figure 11 exhibits the number of waterfowl hunting applications for the principal San Joaquin Valley state wildlife areas and national wildlife refuges for the 1986-87 and the 1987-88 hunting seasons (see Figure 2, "Study Area" map). The wildlife areas and refuges presented are Kestersen, San Luis, Merced, Volta, Los Banos, Mendota, and Kern. In Figure 11, the names Kestersen, Los Banos, and Mendota are abbreviated to Kester., L. Banos, and Mend., respectively. These data were obtained from the California Department of Fish and Game. The Department did not supply data on the Pixley National Wildlife Refuge.

Figures 3 - 10. Hunting Statistics by Game Type for San Joaquin Valley Counties

Figure 3.

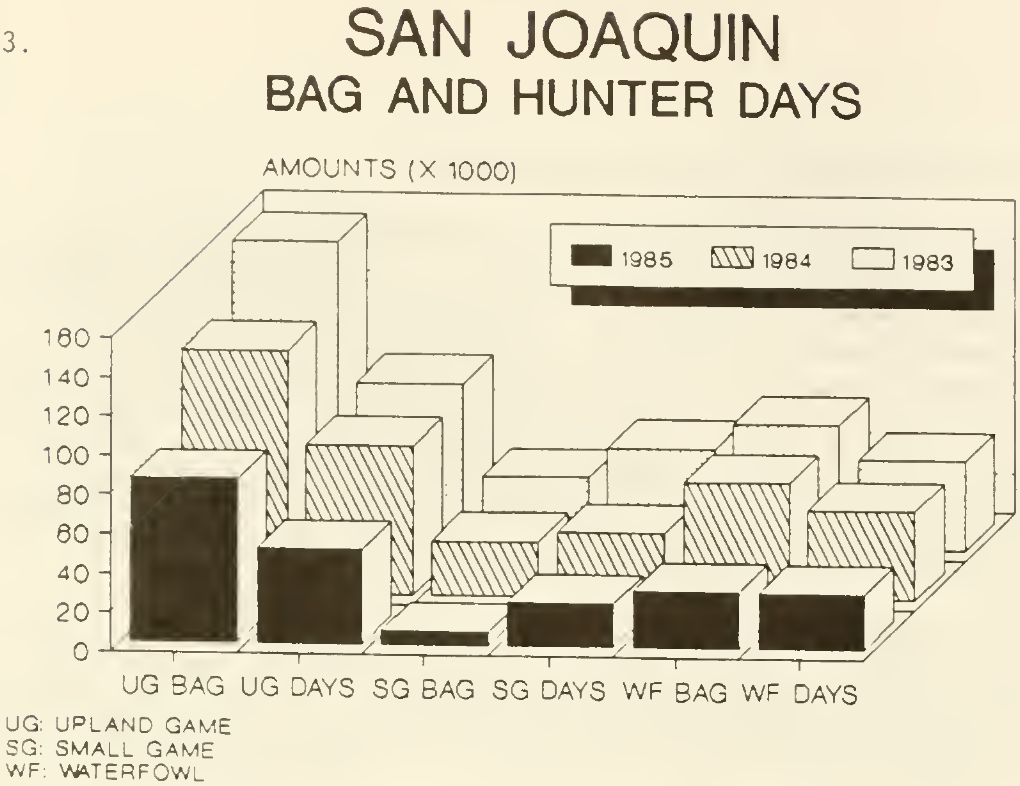


Figure 4.

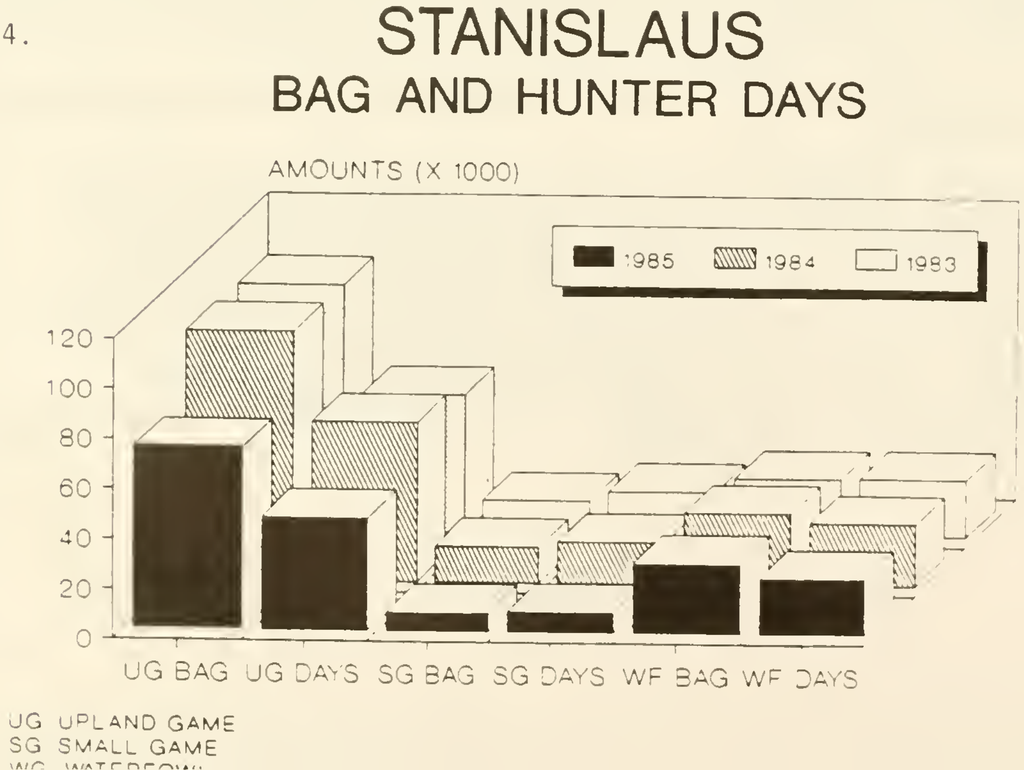


Figure 5.

MERCED
BAG AND HUNTER DAYS

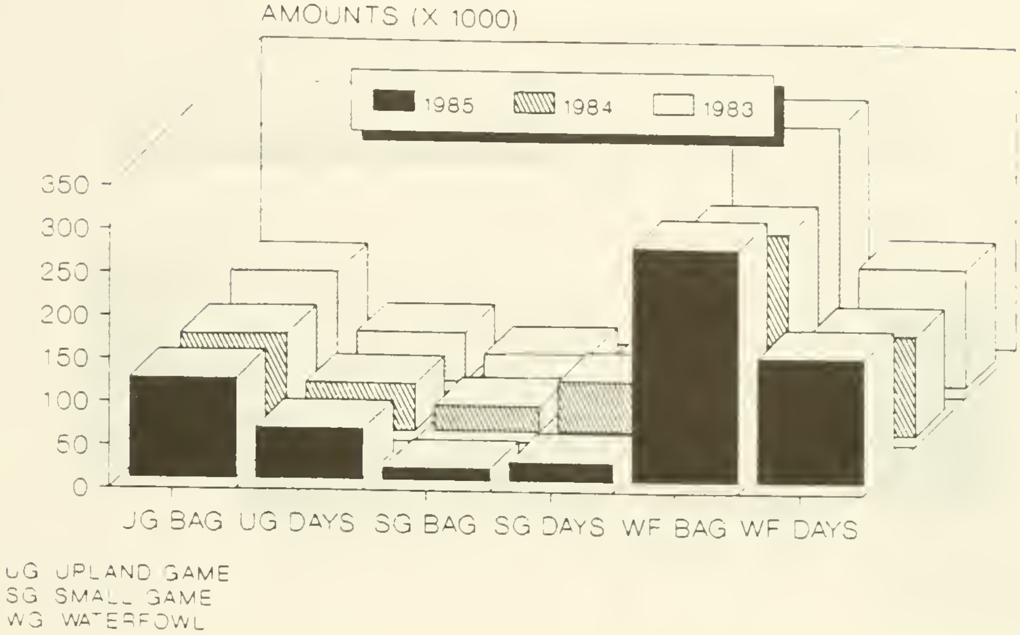


Figure 6.

MADERA
BAG AND HUNTER DAYS

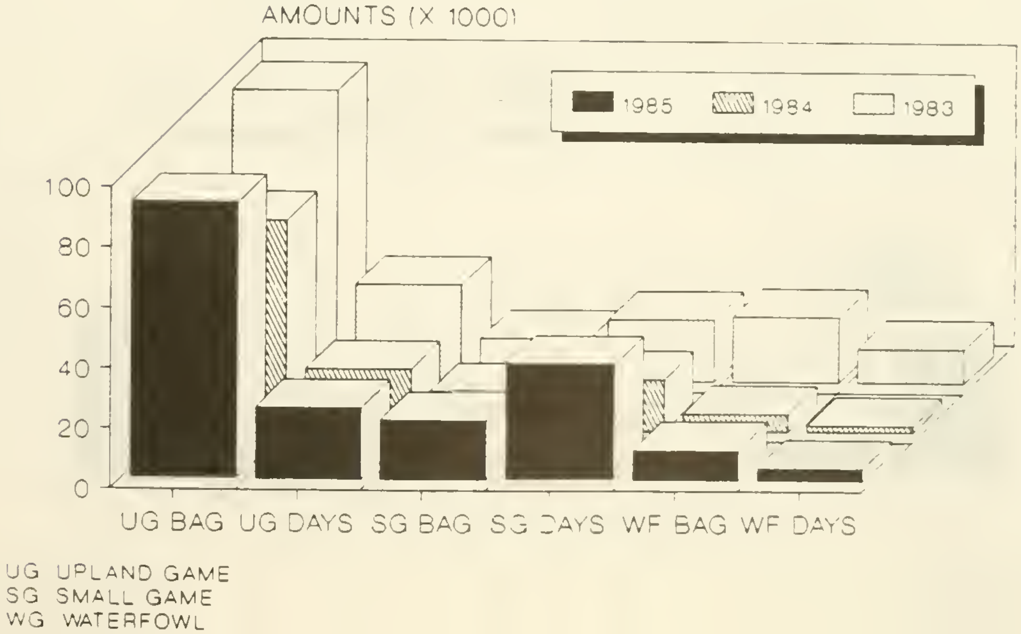


Figure 7.

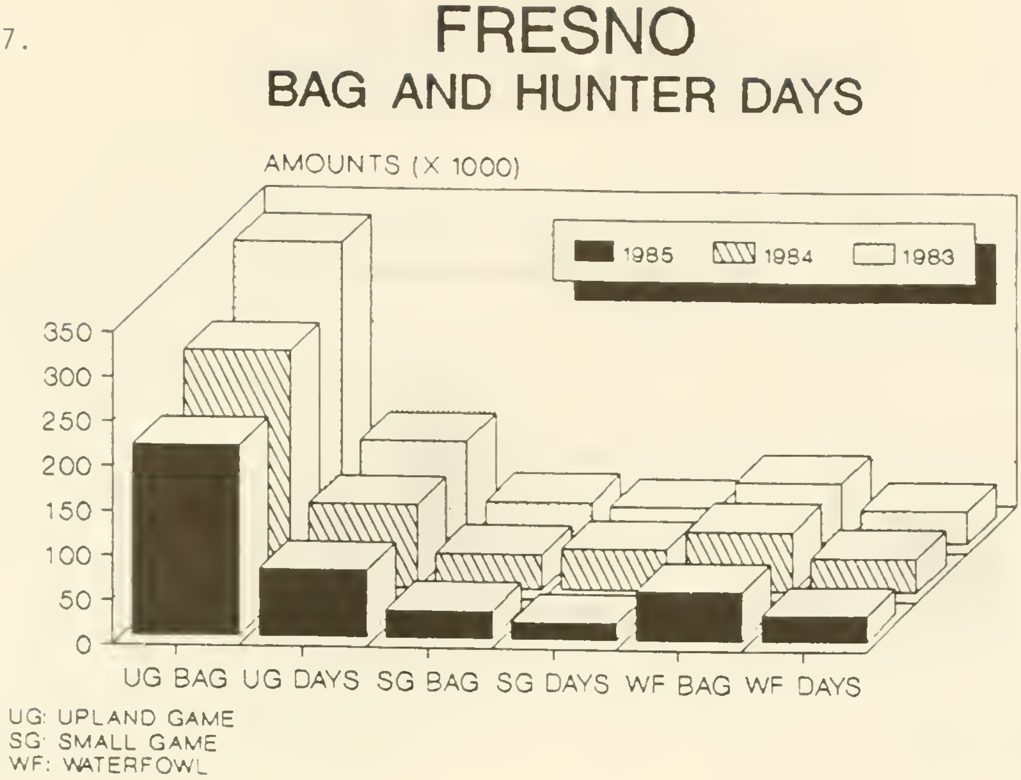


Figure 8.

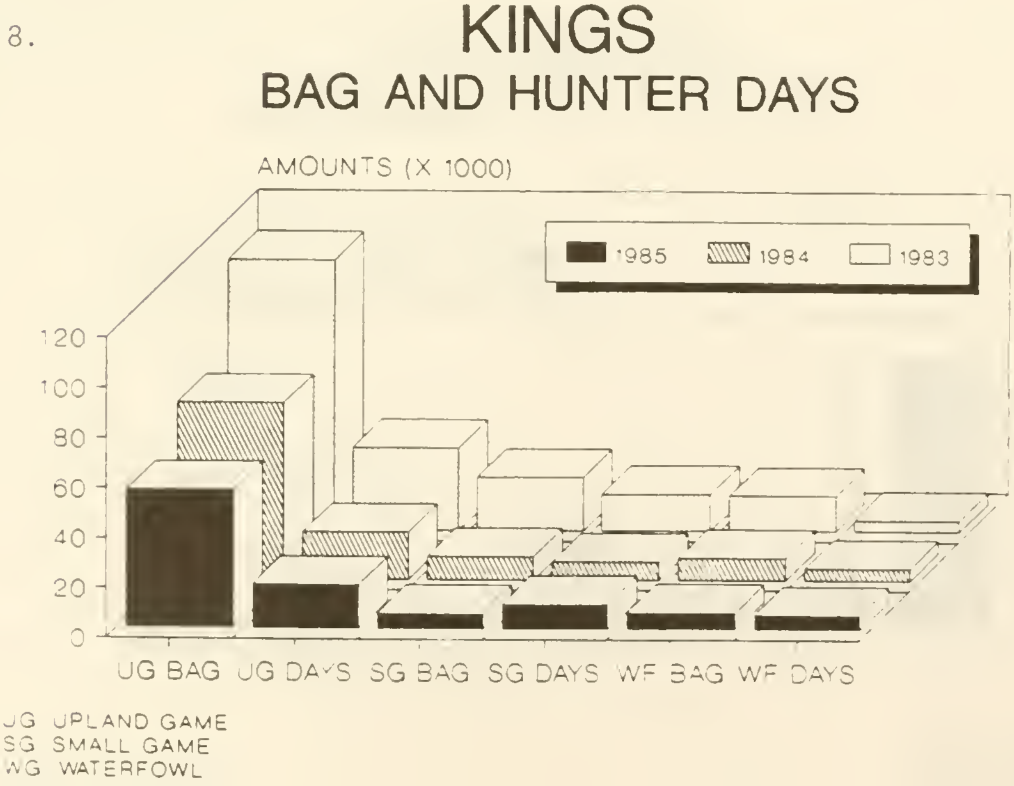


Figure 9.

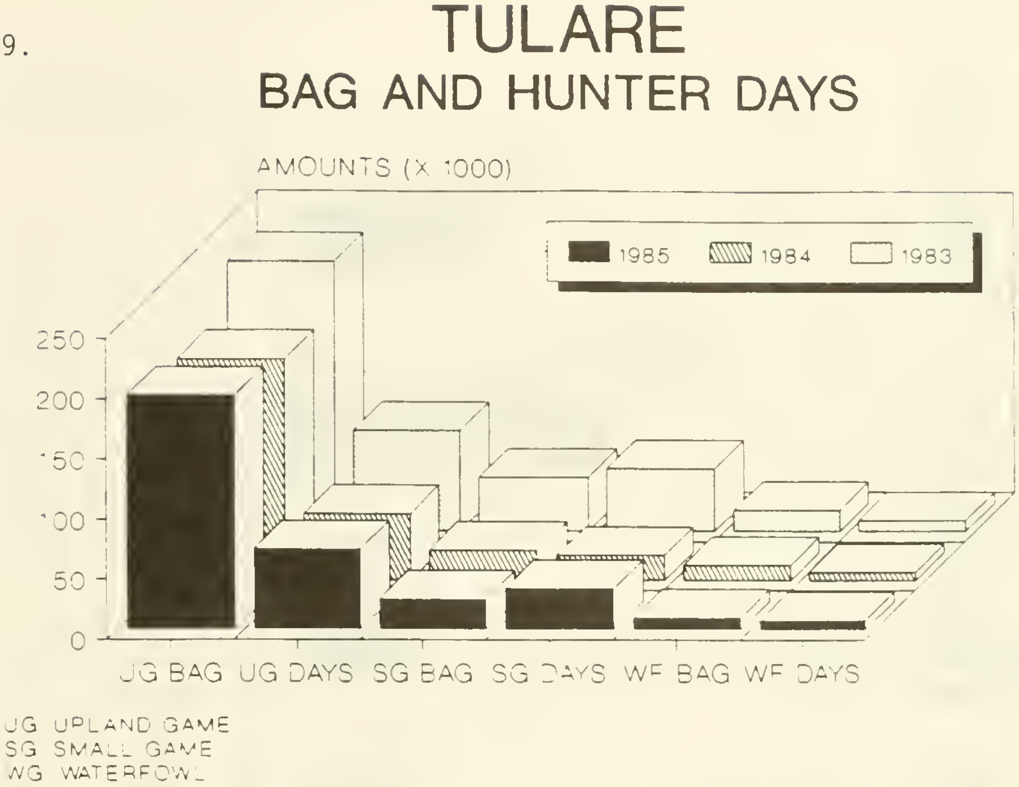


Figure 10.

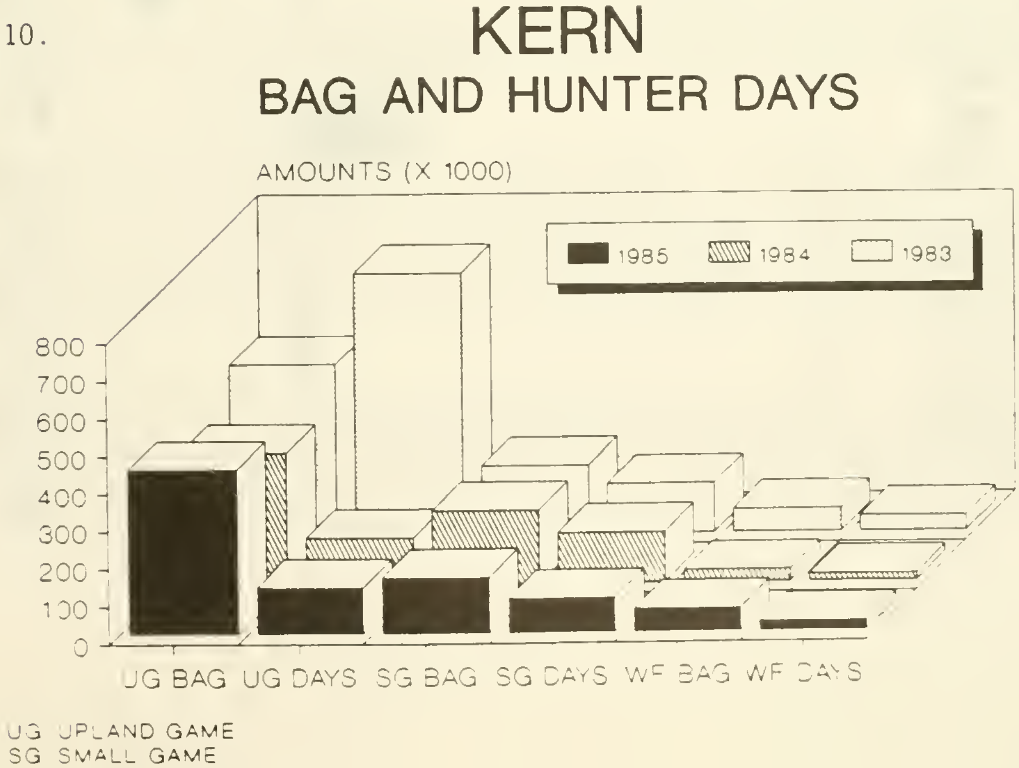
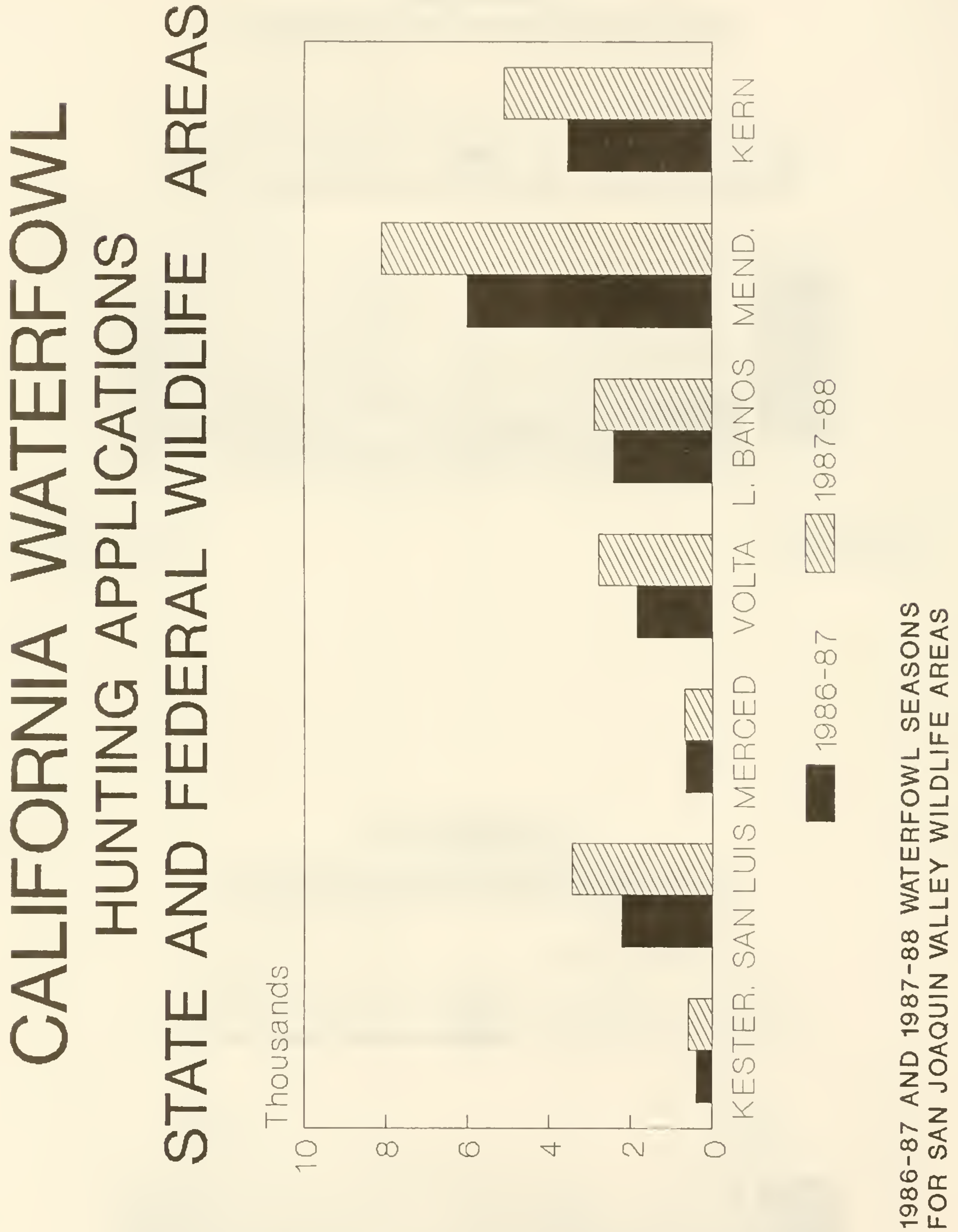


Figure 11. Waterfowl Hunting Applications for San Joaquin Valley State Wildlife Areas and National Wildlife Refuges.



B. NONCONSUMPTIVE USE DATA

B.1. California Nonconsumptive Survey - Bird Viewing.

In the Fall of 1987 the University of California-Davis (with funding provided by California Department of Fish and Game) performed a mail survey of 3000 randomly selected California households. The actual sample is a population weighted sample drawn by a professional survey research firm (Survey Sampling, Inc.). The survey asked about viewing birds and deer in California. After deleting the undeliverable questionnaires, the overall response rate to this survey was 44%. While a higher response rate would be desirable, this is an acceptable response rate. It is equal to or greater than the response rates for similar CVM surveys conducted in California over the last few years. Based on the sample design and response rate, we believe the sample is quite representative of Californians who are interested in wildlife.

Presented in tables I and II are the estimates of all trips taken by California households for the **primary purpose** of viewing wild birds and for **all recreational trips** taken, respectively. The figures are limited to those for San Joaquin Valley counties.

Table I is a compilation of the responses to questions (2), (3a), and (11) from a nonconsumptive wildlife use survey of California households (see Appendix D for a copy of the survey). The respondents, each of whom represent a household in California, were requested to answer these questions only if they saw any birds in the past twelve months of 1987 on any outdoor recreation trips. Question (2) asked for the map area (see Figure 1 from Section I) and county of the **most recent** outdoor recreation trip away from home in which the respondent saw wild birds. Question (3a) asked how many of these trips to the region stated in (2) were for the **primary purpose** of viewing wild birds. From question (11), which asked for other areas in California which the respondent has visited in the past 12 months where he or she saw wild birds, the map area numbers and the counties visited for the **primary purpose** of viewing birds were extracted and combined with those from (3a).

Both tables are organized by county. **Sample** is the total number of surveys returned with San Joaquin Valley Counties as the destinations. The tables present the total number of trips to each county and, at the bottom of each table, the sum of all trips to the region. Note that for Table I data were available for only the San Joaquin Valley counties of San Joaquin, Merced, and Fresno.

Because only a percentage of the total California households were sampled, the sample data on trips must be expanded to an equivalent statewide use level. The estimated total trips in tables I and II expands upwards (i.e. increases) the trips per region to account for the difference between the actual population size of California and the size of the sample. The response rate for the survey was 44 percent, for a total California-wide sample size of 1,059 households returning the surveys. Of these households, 922 answered the questions used in the compilation of the tables. Multiplying the response rate of 44 percent by the total number of households in the state, which is 9,820,000 (1987 estimate: California Statistical Abstract, 1987), and dividing this figure by 922, yields a sample expansion factor of 4,686. The product of multiplying this sample expansion factor by the sample trips per region is the estimated total number of trips per region.

Tables II presents the summary statistics on all outdoor recreation trips taken in the San Joaquin Valley in 1987 in which the households viewed birds. This table includes the data on trips for the primary purpose of viewing birds plus trips for all other recreational reasons besides viewing birds.

TABLE I. ESTIMATED TOTAL TRIPS BY CALIFORNIANS VISITING THE SAN JOAQUIN VALLEY FOR THE PRIMARY PURPOSE OF VIEWING BIRDS IN 1987

COUNTY	ESTIMATED TOTAL TRIPS PER COUNTY	SAMPLE SIZE
SAN JOAQUIN	23,430	3
MERCED	166,353	4
FRESNO	23,430	2
TOTALS:	213,213	9

Data source: Nonconsumptive Wildlife Use Bird Survey.
Note: Data unavailable for the other SJV counties.

TABLE II. ESTIMATED TOTAL GENERAL PURPOSE RECREATIONAL TRIPS BY CALIFORNIANS TO THE SAN JOAQUIN VALLEY IN 1987 IN WHICH WILD BIRDS WERE SEEN

COUNTY	ESTIMATED TOTAL TRIPS PER COUNTY	SAMPLE SIZE
SAN JOAQUIN	487,344	8
STANISLAUS	159,324	8
MERCED	185,097	5
MADERA	107,778	7
FRESNO	149,952	13
KINGS	65,604	5
TULARE	318,648	34
KERN	260,073	15
TOTALS:	1,733,820	95

Data source: Nonconsumptive Wildlife Use Bird Survey.

Total adjusted outdoor recreational trips for all of California in 1987 are approximately 27.3 million trips, which is 13 percent lower than the 31.5 million estimated by the State of California Report (California Department of Parks and Recreation, 1987). However, the 27.3 million trips are 8.4 percent larger than the U.S. Fish and Wildlife Service's 1985 Nation Survey estimate of 25 million trips for California (U.S. Fish and Wildlife Service, 1988).

B.2 Major Recreational Uses for California's Waterfowl Areas.

Figure 12 presents the major nonconsumptive uses for all California State-owned or operated waterfowl areas for the period 1981-2. The data are displayed as a percentage of total use days for the period. The source of these figures is the California Department of Fish and Game report Public Recreation Use on State-owned or Operated Areas, 1970-1982 by Loti E. Calliga, Wildlife Management Branch. The waterfowl areas surveyed for the report are Honey Lake, Gray Lodge, Grizzly Island, Volta, Los Banos, Mendota, Imperial Wister, and Imperial Finney-Ramer. The report does not breakdown the major uses by site. As shown in the pie-chart, sightseeing is the major nonconsumptive use in California's waterfowl areas.

For the San Joaquin Valley waterfowl areas Volta, Los Banos, and Mendota, total nonconsumptive recreational use days were 12,415 in the 1981-82 season. This figure is 18 percent of the 68,972 total recreational use days for the season, the rest being consumptive use days, which are composed of fishing and hunting. For these three sites, figures are not available separating out fishing and hunting as percentages of consumptive use days.

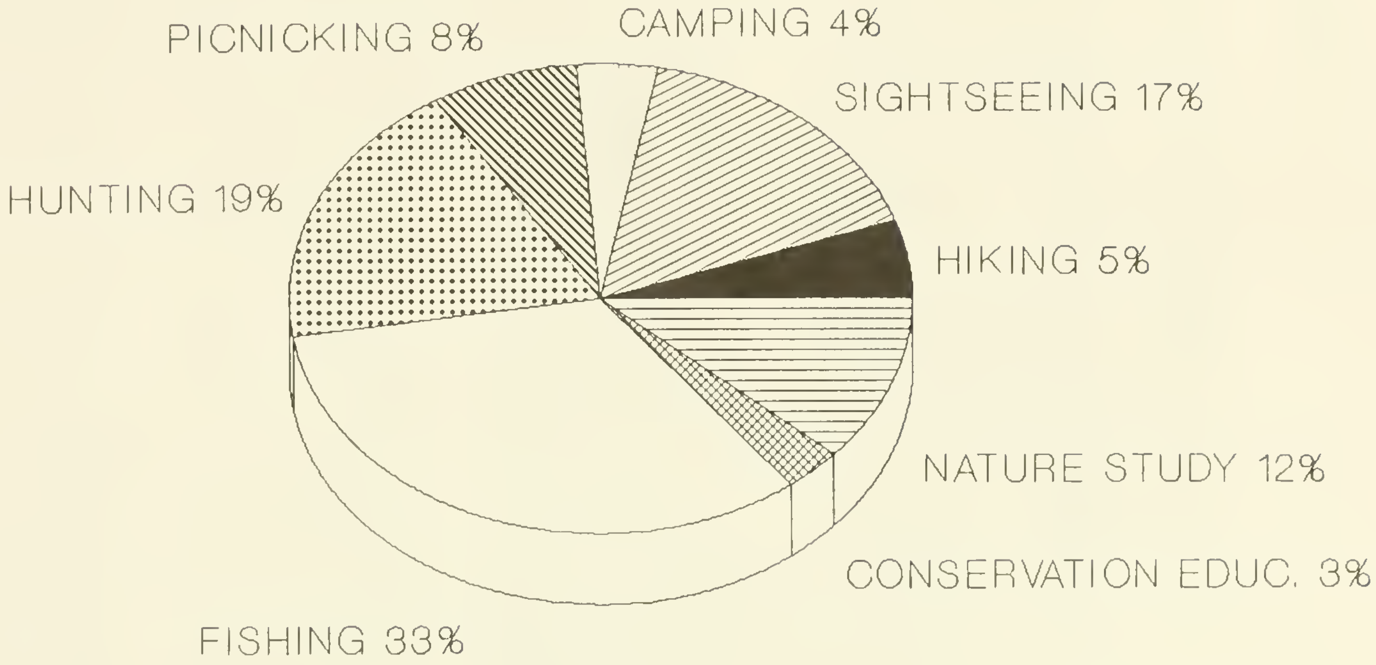
For all the waterfowl areas surveyed, 48 percent of the 310,929 total recreational use days were for the nonconsumptive uses. Of the total recreational use days, 19 percent were for fishing and 33 percent for hunting.

In the report, a user day is defined as a unit of measure that shows an individual's involvement in a single activity (use) while at an area. An individual participating in several activities (uses) during a single day would result in a measurement of several user days of use. There is no time limit to qualify a person as having participated in an activity.

Of the three state-owned or operated wildlife areas that were included in the report, none were in the San Joaquin Valley. Except to make clear that waterfowl areas are not a subset of wildlife areas, the report does not define the distinction between the two areas.

Figure 12.

MAJOR RECREATIONAL USES
CALIF. STATE-OWNED OR OPERATED WATERFOWL AREAS, 1981-2



Values are in percentage of use days.

CHAPTER THREE. ECONOMIC BENEFITS

A. CONCEPTS

In order to clarify the discussion of the economic benefits of hunting and viewing wildlife, several terms will be defined in this section.

CONSUMER SURPLUS is the economist's term for net willingness to pay (see definition of willingness to pay). Consumer surplus represents the consumer's additional (net) willingness to pay for the opportunity to, for example, hunt or fish at some site. It is net or additional willingness to pay since it is in addition to their current expenditures. Note that current expenditures refer only to costs relating to a particular trip, such as lodging and food costs, and not to other non-trip related costs such as those for binoculars or firearms, which are costs not necessarily relating to any particular trip. Since the latter items can be used for any trip and over several seasons, they should not be current expenditures for a given trip.

FINANCIAL VALUE is the amount of revenue a business (e.g. farmer, rancher) receives from the sale of a product or service (e.g. hunting access).

An INVERSE DEMAND FUNCTION is a demand function where the price is a function of the quantity demanded of that good and of other variables that determine price. Alternatively, the demand function can be written with quantity demanded as a function of the price of that good and of other variables that determine quantity demanded. The two possible formulations differ only in the sense that one is simply the inverse of the other.

LOGIT MODEL: The logit model is an econometric model in which the statistical equation has a limited dependent variable, i.e. the dependent, or left hand side variable, consists only of zeros and ones. If one considers that a "yes" equals 1 and a "no" equals 0, the logit model can be used to perform regressions (i.e. statistical analysis) on willingness to pay questions that require a dichotomous "yes" or "no" answer. Hence, the logit model can be used to statistically analyze close-ended CVM questions. This model is used in Section C.4 of this chapter.

NON-MARKET GOOD: A non-market good, as opposed to a market good, is one which is not readily traded on the open market. The dollar value of a market good, a packaged frozen fryer for example, is readily determined: it is the dollar value - determined through the interaction of the forces of supply and demand - stamped on the good in the local grocery store. On the other hand, a waterfowl bagged in a SJV wildlife refuge is a non-market good. The payment the hunter must make for it is the cost of the hunting application. This payment, or fee, is administratively set by the government, frequently with little consideration for the interaction of supply and demand for the animal. Hence, the fee is not a market-clearing price (i.e. the price at which the supply equals the demand for the good).

To make an estimate of what the market-clearing price would be if there was a market for the good, some sort of non-market resource valuation techniques are needed. Possible techniques, such as the Hedonic Price Approach, the Contingent Valuation Method, and the Travel Cost Method, are discussed in the Methods section of Chapter 3 of this report.

Because the public decision makers are frequently required to decide how to allocate finite state resources among many, often competing uses of public properties, if the public decision makers are to make sound allocation decisions, they must know the values society places on the various uses. Hence, the techniques mentioned above are useful in valuing the uses or goods whose values are not determined in the market place.

WILLINGNESS TO PAY: Maximum **net** willingness to pay is the maximum increase in price above current costs a person would be willing to pay for the purchase of a good or service. Examples of a "good" are a waterfowl hunting trip or the viewing of a wild bird. Total or gross willingness to pay is the sum of net willingness to pay and the amount actually spent on the good. Since the amount actually spent is part of the cost of participation, the benefits (i.e., the **net** willingness to pay) are just the amount in excess of what people spent .

Many Federal agencies are required by U.S. Water Resources Council Principles and Guidelines (1983) to use the concept of net willingness to pay (e.g., net economic value) as a measure of value in benefit-cost analysis or evaluation of Federal actions. When performing natural resource damage assessments, the U.S. Department of Interior regulations require that the calculation of economic values lost to society be measured in terms of net willingness to pay (U.S Department of Interior, 1986). Use of the net willingness to pay criteria is also recommended in textbooks on Benefit Cost Analysis (Sassone and Schaffer, 1978; Just, Hueth and Schmitz, 1982).

WILLINGNESS TO ACCEPT (WTA): This is the minimum dollar amount a person would accept to give up recreating at an area for some specified amount of time. It can also be the minimum dollar amount for which the person would "sell" his or her right to use the resource for some specified period of time. If the individual has the property right to his or her current use of the resource, WTA is the conceptually correct measure to use when valuing losses. Most agencies do not use WTA since it is difficult to accurately measure and because, in many settings, the current recreationists do not have a legal right to the current recreational resources. As a result, WTP is often used as a proxy for WTA in those cases where WTA is the appropriate value. However, this can lead to undervaluation of the resource in cases where the resource loss is very large. Empirical studies that measure WTA are quite rare compared to studies which measure WTP.

B. METHODS

Two types of economic valuation methods dominate this field: one designed to measure the value to society (Travel Cost Method and Contingent Value Method) and another to measure the financial value to the farmer or rancher (Hedonic Price Approach). Both the Travel Cost and Contingent Value Methods are recommended for use by federal agencies when performing benefit-cost analysis (U.S. Water Resources, 1979, 1983). The U.S. Department of Interior (1986) has given the Travel Cost and Contingent Value Methods "rebuttable presumption" in court for use in valuing natural resource damages.

CONTINGENT VALUATION METHOD (CVM): Along with Travel Cost Method (TCM), willingness to pay can be directly measured by using the CONTINGENT VALUATION METHOD. This method is sometimes referred to as the bidding method. In essence, a hypothetical but realistic market for some type of non-market good, say recreational trips, is established. In open-ended questions, the respondent is asked to state the maximum amount he or she would pay for the good, in this example a recreational trip to some site, including access and use fees. In close-ended (or dichotomous choice) questions, rather than requiring the respondent to state his or her maximum willingness to pay for a good or service, the respondent is asked whether he or she would pay some amount stated in the question. For a thorough discussion of the strengths and weaknesses of the Contingent Valuation Method see Schulze, et al., 1981 or Cummings, et al., 1986.

As well as establishing the value of on-site recreational uses, CVM can, with the appropriate questions, be used to estimate option, bequest, and existence values. CVM has also been used to obtain the general public's existence value for preservation of unique species such as whooping cranes and unique natural environments such as Mono Lake. As with the estimation of on-site values, open and/or close-ended questions would be used. Generally, CVM is not used to estimate the value of a market good as its value would have already been determined in the market through the forces of supply and demand.

In general the Contingent Valuation Method estimates of net willingness to pay are consistent with the estimates of net willingness to pay from the Travel Cost Method (Walsh, 1987).

With regards to the accuracy of CVM, recent research on this issue has been performed at University of Wisconsin. Welsh (1986), with permission from Wisconsin Department of Natural Resources, bought and sold a one day deer hunting tag for the Sandhill Demonstration area. Two parallel markets were established: (1) one real market where the hunters surveyed could actually buy the deer tags for real money and (2) an identical CVM survey of hunters except that no cash changed hands. Comparison of the results from the two markets showed that CVM yielded a value 25% higher than the actual cash value of the deer hunting tag.

Loomis (in press) has recently tested the reliability of the CVM using the test-retest approach. In surveys of both visitors and the general public, willingness to pay responses were not statistically different between the first survey and the second survey nine months later.

TRAVEL COST METHOD (TCM): TCM statistically traces out a demand equation, using observations of travel distance as a measure of price and trips taken as a measure of quantity. The resulting first stage, or per capita demand equation allows the analyst to calculate the additional amount recreationists would pay over their travel costs to have access to the site for viewing, hunting, or fishing. This calculation is made using a "second stage", or site, demand curve that relates added distance or added travel cost to, for example, trips at a particular hunting district. See Clawson and Knetsch (1966), Dwyer, Kelly and Bowes (1977), Sorg and Loomis (1985) or Ward and Loomis (1986) for a discussion of the basic TCM approach.

The regional TCM approach is recommended by the U.S. Water Resources Council (1979, 1983) as one of the two preferred techniques for estimating recreation benefits (the other being the Contingent Valuation Method). The method is one of the most widely applied demand estimating techniques.

HEDONIC PRICE APPROACH: This approach can be used to measure both the financial (i.e., landowner) and economic values (i.e., societal) of natural resources. This approach decomposes the total value of a piece of land or recreational experience into the separable values of each attribute. For example, different land parcels that have differing water quality levels, wildlife, etc., will have differences in their property values. This approach can also be applied to determining the value a hunter places on different characteristics of the hunt. For example, the hunter probably has different values for harvesting a trophy deer and for hunting in a scenic area. In essence, this method examines how the price of an non-marketed natural resource varies with the price of a marketed resource that is bundled with the non-marketed resource.

C. REVIEW OF RELATED STUDIES AND BENEFIT ESTIMATES

1. Literature Search Procedures.

In order to find studies relevant to the study objectives outlined in the Introduction, a literature review was conducted. The literature search involved finding studies relating to the topics of wildlife values in California, the Central Valley and, especially, the San Joaquin Valley, and the economic values of upland game bird hunting, waterfowl hunting, and birdwatching in California. The desired publications would be studies estimating willingness to pay, financial values, and expenditures for the categories stated above.

The core of the search was conducted on the Dialog Information Services computer system. This service tracks selected government publications (thru AGRICOLA), master's and Ph.D. dissertation abstracts, journal articles, and books. **The Journal of Economic Literature** was also scanned for the relevant topics. In addition to tracking formal publications with the Dialog system, we made use of the services of the government documents section of U.C. Davis' Shields Library. The search was limited to literature published within the last ten years. Any economic studies older than this would be too out of date in terms of dollar valuations of wildlife, and furthermore, there is little in the way of contemporary methodologies to be found prior to the period of the search. The printed results of the Dialog literature search are available from the authors.

Unfortunately, when the geographic range of the search categories was limited to California, no published studies of any relevance were found using the Dialog system. However, the Dialog data base, as extensive as it is, is not comprehensive. Through additional research, other studies were reviewed (e.g. Transactions of the North American Wildlife and Natural Resources Conference).

2. Existing Literature: Annotated Bibliography.

Outside of the material compiled by the California Department of Fish and Game, four studies were found pertaining to California . The studies are:

Miller, Jon R.. **An Estimate of the Value of a Waterfowl Hunting Day in the Central Valley of California**. The Department of Economics, University of Utah, Salt Lake City. Prepared for the Division of Program Plans, U.S. Fish and Wildlife Service (January, 1986).

The purpose of Miller's paper was to estimate the average value of a waterfowl hunting day in the Central Valley region of California, using data from the 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation [U.S. Fish and Wildlife Service, 1982]. Using the Contingent Valuation Method (CVM), the mean (across individual hunters) consumer surplus per day was estimated to be $38. While this paper presents a solid application of CVM, the sample size was quite small.

U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region. Report on Refuge Water Supply Investigations, Central Valley Hydrologic Basin, California. Draft report. Volume 1 (November, 1987).

This U.S.B.R. study was conducted to identify potential water sources and delivery systems for providing a dependable supply of good quality water to ten National Wildlife Refuges, four State Wildlife Management Areas, and one private wetland area within the Central Valley hydrologic basin of California. Both consumptive and nonconsumptive visitor days and net economic value are quantified. However, the net economic value calculations were performed using the U.S. Water Resources Council Unit Day Values. This value, $21.66 per use day for both consumptive and nonconsumptive uses (page III-3 of the study), is an inflation adjusted value taken from a study done in the 1960s. This $/use day value is multiplied by the sum of the consumptive and nonconsumptive use days under alternative water levels at a NWR to estimate the changes in visitor days and value associated with different water levels. Since no formal, statistically rigorous studies were conducted to determine the on-site user values for these NWRs, the values generated for this study are unlikely to be valid. The values estimated by this study are unlikely to be similar to those that would be estimated through contemporary site specific CVM, TCM, or HPA methods.

Loomis and Cooper, in progress. Economic Value of Waterfowl Hunting in Ten Selected California State and Federal Wildlife Areas.

Using hunter application data, Loomis and Cooper are in the process of estimating Travel Cost Method (TCM) demand curves and net willingness to pay for waterfowl hunting in California's Central and San Joaquin Valley refuges for the 1987-88 hunting season. Preliminary research suggests that the average value (consumer surplus) per hunter-day for all the sites is $62.00. The average value for the seven SJV sites studied is $55.41. In the October 1987 thru January 1988 hunting season, 27,603 hunters went to these seven refuges. The total consumer surplus for each of the seven sites is the product of that site's consumer surplus per hunter-day and the total number of hunters who went to the site. The sum of the total consumer surplus across all these seven sites is $1.6 million. Table III presents the consumer surplus per hunter day and the total consumer surplus per site for the San Joaquin National Wildlife Refuges and Wildlife Areas examined in the paper.

TABLE III. CONSUMER SURPLUS PER HUNTER-DAY AND TOTAL CONSUMER FOR THE 1987-88 SEASON FOR SELECTED SAN JOAQUIN VALLEY WILDLIFE AREAS.

REFUGE	CONSUMER SURPLUS PER HUNTER-DAY	TOTAL HUNTERS	TOTAL CONSUMER SURPLUS
KESTERSEN NWR	$37.19	1,803	$67,054
SAN LUIS NWR	$51.11	3,418	$174,694
MERCED NWR	$43.46	710	$30,857
VOLTA WA	$60.01	4,067	$244,061
LOS BANOS WA	$62.98	3,354	$211,235
MENDOTA WA	$63.74	12,055	$768,386
KERN NWR	$69.36	2,196	$152,315
AVERAGE:	$55.41	27,603	$1,648,600

Although few relevant studies dealing with California were found, studies in these fields using data from outside California have been done. Among these are:

Farber, Stephen and Robert Costanza. The Economic Value of Wetland Systems. Journal of Environmental Management (1987)24, p.41-51.

Farber and Costanza's study used an economic willingness-to-pay method of establishing the social value of a wetlands system. The economic approach considers the commercial, recreational, and storm protection value of wetlands. The method is applied to the wetlands system in South Louisiana. Their estimate of the total social value of wetlands ecosystems was $590 per acre using willingness to pay for commercial fishing and hunting, recreation, and storm wind protection.

Hay, Michael J. and J. John Charbonneau. Estimating the Marginal Value of Waterfowl for Hunting. Division of Program Planning, U.S. Fish and Wildlife Service, Washington, D.C. (1979).

In this paper, Hay and Charbonneau used contingent value and hedonic price models to estimate values for duck and goose hunting in each of the four migratory bird flyways in the U.S.. The data were collected from a 1974 nationwide survey of waterfowl hunters. The 1974 annual hunting benefit for the four flyways ranged from $9.91-19.16 per acre of wetland in the flyways.

Miller, Jon R. and Michael J. Hay. Determinants of Hunter Participation: Duck Hunting in the Mississippi Flyway. American Journal of Agricultural Economics (1981) p.677-684.

In this paper, Miller and Hay evaluated the relationships among habitat availability, hunter success, and the rate and intensity of participation in duck hunting in the Mississippi Flyway. Using socioeconomic data from the 1975 **National Survey of Hunting, Fishing and Wildlife Associated Recreation**, and waterfowl habitat data from the 1970 Flyway Habitat Management Unit Project, they estimated probability and intensity of participation equations for duck hunting. Logit analysis was used to estimate the participation probability equations. The authors found that the average value for duck hunting was $82 per acre.

Walsh, Richard G., Donn M. Johnston, and John R. McKean. Review of Outdoor Recreation Demand Studies With Nonmarket Benefit Estimates, 1968-1988. Review Draft. Department of Agricultural and Resource Economics, Colorado State University, Fort Collins. (June, 1988).

This Walsh et al. paper reviewed nine studies (none in California) dating from 1974 to 1987 that estimated the consumer surplus value per activity day of small game hunting. The average values of these studies are presented in the Table IIIA. The column labelled "Adjusted for Method" reflects the updating of the economic values derived from older studies to account for new refinements in the methodologies. For example, adjustments include accounting for travel time in pre-1970 TCM demand studies and the omission of non-residents in TCM studies. For further information see Walsh et al. (1988).

TABLE IIIA. VALUE PER ACTIVITY DAY - SMALL GAME HUNTING

TIME PERIOD	REPORTED	ADJUSTED TO 1987	ADJUSTED FOR METHOD
Average Total Value	$18.78	$31.62	$31.22
1983-1987 studies	$21.58	$27.71	$25.34
1968-1982 studies	$16.54	$34.74	$35.92

This paper also reviewed nine studies (none on California) dating from 1972 to 1987, some of which are the same as the small game hunting studies, that estimate the value per activity day of waterfowl hunting. The average values of these studies are presented in Table IIIB.

TABLE IIIB. VALUE PER ACTIVITY DAY - WATERFOWL HUNTING

TIME PERIOD	REPORTED	ADJUSTED TO 1987	ADJUSTED FOR METHOD
Average Total Value	$23.55	$44.01	$43.64
1983-1987 studies	$14.50	$19.96	$18.31
1968-1982 studies	$23.93	$50.88	$50.88

In terms of the methodologies employed to quantify economic values (e.g. net willingness to pay) of hunting, the Travel Cost and Contingent Valuation Methods were the most frequently used. The hedonic price approach has seen some limited application in the mid-1970's but little application recently.

The $43.64 adjusted for method value per activity day for waterfowl hunting is 21 percent less than the $55.41 value per hunter, or activity, day (see Table III) reported by Loomis and Cooper for the SJV refuges for the 1987-88 season.

3. Private Financial Values.

In addition to hunting in the public refuges, hunting on private land is available through duck hunting clubs and through access provided by private farmers and ranchers. Jones and Stokes Associates' (Sacramento, CA) 1988 report, Private wetlands in the Kern-Tulare Basin, California: Their Status, Values, Protection, and Enhancement, provides some figures regarding private hunt clubs.

Among the findings, Jones and Stokes Associates found that the total hunting days per club averaged 433 days, and ranged from 38 to 2,465 days. There are 50 hunting clubs in this area. A membership fee is required by these clubs. The types of charges for club membership included payment of an annual fee ("shooting fee") or both an annual fee and a shooting fee. Costs per member at the 27 clubs that charged only an annual shooting fee averaged $926 and ranged from $250 to $2,050. All nine clubs that charged a one-time ownership or initiation fee also charged an annual fee. One-time costs averaged $9,000, while annual charges at these clubs averaged $1,120. Annual costs of an ownership can be considered as the revenue foregone by making a long-term investment in the duck club rather than elsewhere in the economy. Assuming an annual rate of return of 6 percent, the annual membership cost for those clubs charging both ownership and annual fees was $1,660. Combining annualized values of all fees charged at all clubs, the average annual cost to an individual for membership in a Kern-Tulare duck club is $1,110.

Jones and Stokes Associates also rated the level of satisfaction of club members with their club hunting experience. Of 35 respondents (each of whom surveyed the members of his respective club), 25 percent expressed very high or high satisfaction, and 57 percent expressed moderate satisfaction. Seventeen percent of the respondents expressed low satisfaction. When asked to explain which factors were important in determining club members' satisfaction, 81 percent rated waterfowl harvest levels as "very important." The cost and quality of facilities were substantially less important than harvest in determining hunter satisfaction.

They also asked each contact to rate the importance of potential threats to his club and of general threats to wetlands and waterfowl in the Kern-Tulare basin as a whole. Club representatives identified the major threats (listed in order from most to least important) as: 1) too few ducks, 2) high cost of water, 3) reduced food availability due to poor marsh management practices, and 4) too much sanctuary area on refuge (Kern N.W.R.) and other large waterbodies [it is not known what "large" waterbodies in the Kern N.W.R. the last part of this sentence refers to].

In addition to the study on the Kern-Tulare basin, a study with some relevant data on duck clubs has been done on the wetland areas encompassing the Grasslands Water District (Campbell, Mark. October, 1987) in the Central San Joaquin Valley near Los Banos. The author found that within this water district 152 duck hunting clubs were active in the 1986-87 waterfowl hunting season. Average club size there is 293.73 acres. A nonstandardized survey of the duck hunting clubs found that most of the clubs responding to the survey had an average membership age in the 50s. Hunting blind rental fees range from $1,000 to $2,500 per year, with an average of $1,543 per year. Most clubs limit themselves to two shoot days per week, with a 1986-87 season total of 29 shoot days. Hence, the blind rental cost per shooting day averages $53.20. In private clubs in the area, the emphasis is on ownership shares by one or more individuals, though some do rent blinds. The author does not provide the cost of ownership shares in private clubs. In commercial clubs, the emphasis is on blind rentals. The waterfowl bag for the Hollister Club (the only club for which bag data is given) is dominated by ducks at 2,607, followed by geese and pheasants at 60 and 24 respectively, for the 1986-87 season. For this club, average duck bag per hunter per day was 2.90 and the average waterfowl bag per hunter per day was 2.97 for the same season.

John Loomis and Lee Fitzhugh, for their Survey of California Ranchers that Lease Land for Deer Hunting (unpublished) conducted a survey of 56 ranchers in California that lease land for the purpose of deer hunting. Twenty-five counties are represented in the survey, with the locations of the ranches surveyed ranging from Northern to Southern California. Since the sample of ranches in the San Joaquin Valley is too small (only two ranches), the following summary of the survey results encompasses the whole state. The data are 1987 figures.

The authors found that the ranchers surveyed leased an average of 12,604 acres each and received $3.82 in revenues per acre from all species. Nearly 90% of the ranchers leased their land for deer, 33% for turkey, 45% for pigs, 18% and waterfowl, and 51% for upland game birds. In the upland game bird category, half the ranchers offered quail hunting and 36% offered dove hunting.

Of the total revenue per acre of $3.82, $2.66 is from leasing for deer hunting and the rest is from other species. However, an examination of ranchers that offer upland game bird hunting in addition to deer hunting reveals that the revenue per acre from the upland game bird hunting is $1.59 per acre. Subtracting out operating costs from the $3.82 revenue per acre yields a profit of $1.40 on wildlife operations. However, 25% of the ranchers surveyed actually had small negative profits per acre (generally ranging from $0.02 to $0.98 per acre). Finally, the analysis shows that the profit per acre does not vary with the number of acres leased for hunting. These results were generated from data collected from the survey, in which the ranchers were asked to state their total revenues, costs, and acreage leased for deer hunting.

While the average revenue and profit per acre figures provide useful background information, many farmers will be interested in how hunting lease revenue varies with changes in the abundance of wildlife and provisions for hunting related services such as camping, cabins, food, etc.. Statistical analyses of the 56 hunt club (ranch) returns indicate that the harvest success rate and the percentage of the harvest that are trophies are the key contributors to higher hunting lease revenue per acre. It appears that hunting related services such as cabins, food, or even guide services are not consistently significant revenue enhancers. These factors may influence whether or not a hunter selects that particular farm or ranch to hunt, but not the amount of revenue received.

4. Public Benefits - Dichotomous Choice Estimates of Willingness to Pay for Bird Viewing.

Loomis' survey of California households regarding bird viewing presented in section B.1 also included open-ended and close-ended, or dichotomous choice, Contingent Valuation Method questions. These questions were used to estimate trip values.

The average cost and the maximum willingness to pay for the most recent trip are estimated for all of California using an open-ended willingness to pay question. The respondents were asked: (1) what their approximate costs were for transportation, food and lodging of their most recent trip in which they saw wild birds; and (2) what would be the maximum increase in their annual expenses, or maximum net willingness to pay, they would be willing to pay to visit the area of their most recent trip? The results are summarized in Table IV for all trips and for trips were the primary purpose was viewing birds. Note that the primary purpose average net willingness to pay is nearly double the figure for all trips. Since anyone who takes a trip for the primary purpose of viewing birds is likely to be an avid outdoor recreationist, this difference is not surprising. In fact, while bird watchers spend less money on transportation, food, and lodging than do the typical outdoor recreationists, their higher net willingness to pay results in a higher total willingness to pay as well. Unfortunately, the sample for the Central and San Joaquin Valley counties is so small (see Tables I and II for sample sizes) that no reliable inferences can be made about the value of viewing birds in this specific Californian region.

TABLE IV. COST AND OPEN-ENDED WILLINGNESS TO PAY FIGURES FOR VIEWING BIRDS IN CALIFORNIA

	COST	NET WTP	TOTAL WTP PER TRIP (COST + NET WTP)
ALL TRIPS	$16.40	$8.21	$24.61
PRIMARY PURPOSE BIRD VIEWING TRIPS	$12.97	$15.70	$28.67

Close-ended, or dichotomous choice, questions, rather than requiring the respondent to state his or her maximum willingness to pay to view birds in a specific area, simply ask the respondent whether he or she would pay some specific dollar amount stated in the survey. This dollar amount varies from survey to survey. By evaluating the probability of the respondent stating "Yes I would pay the [specific dollar amount]," an expected value of willingness to pay can be computed.

With close-ended willingness to pay questions, the calculation of expected willingness to pay is a two step process. In the first step, a logistic regression, which is equivalent to an inverse demand function, is estimated between probability of a "Yes would pay $X" response as the dependent variable and the amount ($X) as the independent variable. Once this logit curve is estimated, the area under that curve, which is the expected willingness to pay, is calculated.

Table V presents the willingness to pay results for the current condition question "If your annual cost of visiting just this area [the area of the most recent trip in which wild birds were seen] increased by $X would you still visit the site?" The $X amount is the bid amount written into each survey and varies from $1 to $230. Willingness to pay was also calculated for two other conditions where the number of birds seen are increased. Since the number of birds seen was found to be positively related to willingness to pay (WTP), the authors were able to calculate how WTP changed as the number of birds seen were increased. As the results indicate, the respondents are willing to pay more to see more birds.

As can be seen from Table V, trip benefits (economic values) do increase with the number of birds seen. However, the principle of diminishing marginal returns is evident here: each additional bird seen adds less additional enjoyment than the previous bird seen. For example, each person that sees an additional bird has his or her trip's enjoyment increased by approximately $0.50 per additional bird seen up to a 50 percent increase and then about $0.20 more per bird up to double the population (100% more birds). Since each bird seen is a public good available for all the visitors to view, if there are 1,000 visitors a day viewing birds over a 10 to 20 day season, the aggregate benefits of additional birds could be several thousand dollars.

TABLE V. WILLINGNESS TO PAY ESTIMATES FOR VIEWING BIRDS IN CALIFORNIA UNDER THREE DIFFERENT SCENARIOS.

SCENARIO	ANNUAL TOTAL WTP	AVG. NO. OF TRIPS PER YEAR	TOTAL WTP PER TRIP (COST + NET WTP)	NO. BIRDS SEEN/TRIP
CURR. COND.	$112.00	3	$37.33	28
50% MORE BIRDS	$135.00	3	$45.00	42
100% MORE BIRDS	$140.00	3	$46.67	56

CHAPTER FOUR. THE APPROXIMATE MAGNITUDE OF BENEFITS FROM WILDLIFE-ASSOCIATED RECREATION IN THE SAN JOAQUIN VALLEY

Although no data are currently available with which to estimate the total economic value (i.e., on-site recreational values plus option, existence, bequest, and other values) to society of fish, wildlife, and/or their habitats in the San Joaquin Valley, by using the data presented in this study, one can approximate the economic benefits for the current amount of wildlife-associated recreation in the San Joaquin Valley. Estimates will be presented for the categories of small game, upland game birds, and waterfowl (as defined in Chapter II, part A.). The economic benefit of bird viewing is also presented. Total wildlife-associated recreational economic benefits are defined as the total number of hunter (or viewer) days in the San Joaquin Valley times the value per hunter (or viewer) day in the valley.

From Appendix C, the hunting statistics for the San Joaquin Valley, total hunter days for the **small game** and **upland game bird** categories for the 1985 season (the latest season for which these figures are available) are calculated. The figures are 243,334 and 456,925 days, respectively. The most appropriate valuation figures available for these two categories are presented in the Walsh et al. paper (cited in Chapter III, section C.2 of this study). In their paper, the average total value per hunter day for small game hunting was found to be $31.22. Since the small game hunting category in the Walsh et al. paper includes upland game birds, this total value per hunter day can be used for both the **small game** and the **upland game birds** categories. The resulting total annual values for these two categories for the San Joaquin Valley are thus $7,596,887 and $14,265,198, respectively.

For the **waterfowl** category, the value per hunter day for the San Joaquin Valley refuges of $62.00 was obtained from the Loomis and Cooper paper (see Chapter III, section C.2). From the data in Appendix C (source: Report of the Game Take Hunter Survey, published annually by the California Department of Food and Agriculture), the total number of waterfowl hunting days in all private and public areas in the San Joaquin Valley is 265,727, and hence, the total annual value of waterfowl hunting is $16,475,074.

In the estimation of the total value of **viewing birds**, the total number of recreational trips in the San Joaquin Valley in which birds were seen is used. This number is 1,733,820 trips (Table II: Chapter II, section B.1). The total value per trip is obtained from Loomis' dichotomous choice logit model (Table V: Chapter III, section C.4) and is $37.33. The total annual value for bird viewing in the San Joaquin Valley is then $64,723,500. Since data on trips for the primary purpose of viewing birds exist for only three San Joaquin Valley counties, an estimate of the total annual value of trips for the primary purpose of viewing birds in the SJV cannot be made.

CHAPTER FIVE. RECOMMENDATIONS FOR ADDITIONAL STUDY NECESSARY TO ESTIMATE FINANCIAL AND ECONOMIC VALUES ASSOCIATED WITH THE USE OF AGROFORESTRY PLANTATIONS BY WILDLIFE.

Even though the results presented in this report are not specific to the agroforestry plantations, and to a large extent to the SJV, they can serve as rough approximations in determining the value of wildlife associated with the agroforestry plantations. As is evident from the literature review, all studies done so far for California have only determined on-site values. No off-site user values have been estimated for California. Also, no financial values associated with agroforestry plantation wildlife have been calculated.

In light of the deficiencies in the current body of knowledge regarding the values of wildlife and fish in the San Joaquin Valley agroforestry plantations, further studies may be warranted. Specific recommendations for further studies include:

1. Survey of recreational users of agroforestry plantations. This survey would include upland game bird hunters, small game hunters and wildlife viewers. Such a survey would be structured to obtain data to estimate net willingness to pay and expenditures. Both the Travel Cost Method and Contingent valuation methods should be used to quantify net willingness to pay values. Questions asking willingness to accept compensation should also be asked and analyzed using CVM. An input-output model would be used to translate visitor expenditures into changes in SJV personal income and employment.

2. Survey of the general public with regard to their off-site users values of wildlife in San Joaquin Valley. Examples of off-site user values that should be measured include option, existence, and bequest values. This project would be accomplished using the Contingent Valuation Method. This method can be performed using either a mail survey or telephone/mail combination survey. These issues could even be "piggybacked" onto a larger statewide CVM survey dealing with the San Joaquin Valley wildlife and drainage issues. In the survey, both willingness to pay and willingness to accept compensation questions can be asked and analysed.

3. To complement the visitor survey, a survey of private agroforestry farmers would be performed to measure the actual and potential financial values generated by wildlife to owners of the agroforestry plantations.

APPENDIX A.

PERSONS CONTACTED WHO PROVIDED INFORMATION PERTINENT TO THE AGROFORESTRY-WILDLIFE ECONOMICS STUDY.

APPENDIX A. PERSONS CONTACTED WHO PROVIDED INFORMATION PERTINENT TO THE AGROFORESTRY-WILDLIFE ECONOMICS STUDY.

-**Campbell, Mark.** Post Graduate Researcher, University of California, Davis. He supplied a clarification of the techniques he used for the survey of the SJV hunt clubs that was included in his 1987 San Joaquin Valley Drainage Program report.

- **Deuel, Bruce**. Waterfowl Program Manager. California Department of Fish and Game, Sacramento, CA.. Supplied the Report of the Game Take Hunter Survey, California Department of Fish and Game, for the years 1976 thru 1985. He also supplied the report Public Recreation Use On State-Owned Land or Operated Areas, 1970-1982, Cal. Dep. of Fish and Game.

- **Duchole, Gwen**. Project Manager. Montgomery Associates, San Francisco, CA.. Project manager of the team that composed the WILDLIFE RECREATIONAL BENEFITS AND RESOURCE IMPACT tables on the NWR's in the Central Valley presented in the Report on Refuge Water Supply Investigations, Central Valley Hydrologic Basin, California, published by the U.S. Department of Interior, Bureau of Reclamation. Contacted regarding the calculation of benefit estimates in the report. She claimed that the estimates were simple calculations supplied by the NWR managers.

- **Hay, Mike**. Economist. U.S. Fish and Wildlife Service, Washington, D.C.. Contacted regarding the availability of a draft of the California State Report of the 1985 National Survey of Fishing, Hunting, and Wildlife Assorted Recreation. He indicated that the work was behind schedule, and the California State Report would not be ready until late November, 1988. He reaffirmed that he would send the authors a draft of the tables of interest as soon as they are available.

- **Wegge, Thomas**. Economist. Jones and Stokes Associates, Sacramento, CA.. Contacted regarding the acquisition of Jones and Stokes' survey of private waterfowl hunting clubs in the Kern-Tulare Basin. He provided copies of their summary report.

APPENDIX B.
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APPENDIX B. REFERENCES

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APPENDIX C.

HUNTING STATISTICS FOR MAJOR SPECIES HUNTED ON ALL PRIVATE AND PUBLIC LANDS IN CALIFORNIA'S SAN JOACQUIN VALLEY COUNTIES

Source: *Report of the Game Hunter Take Survey*, published annually by the California Department of Food and Agriculture.

YEAR	COUNTY	DOVES			CROW		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	SAN JOAQUIN	62,671	6,076	18,326	2,499	588	1,568
1984	SAN JOAQUIN	83,952	6,264	27,432	2,448	468	1,728
1983	SAN JOAQUIN	109,480	6,348	32,660	2,668	460	7,038
1982	SAN JOAQUIN	112,290	7,220				

YEAR	COUNTY	PHEASANT			QUAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	SAN JOAQUIN	16,268	8,085	26,460	4,263	1,323	3,283
1984	SAN JOAQUIN	32,004	10,296	40,716	7,740	1,692	7,884
1983	SAN JOAQUIN	24,748	8,970	38,686	20,056	2,346	11,224
1982	SAN JOAQUIN	22,534	7,714		15,694	1,748	

YEAR	COUNTY	JACKRABBIT			COTTONTAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	SAN JOAQUIN	4,508	1,078	20,825	2,401	539	1,078
1984	SAN JOAQUIN	23,220	2,412	26,172	3,924	1,188	5,472
1983	SAN JOAQUIN	26,864	2,346	29,118	6,716	1,196	14,444
1982	SAN JOAQUIN	38,570	2,584		4,712	1,102	

YEAR	COUNTY	TREE SQUIRREL			DUCKS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	SAN JOAQUIN	0	0	0	25,921	2,499	16,366
1984	SAN JOAQUIN	540	144	684	50,508	3,420	28,944
1983	SAN JOAQUIN	1,610	322	7,084	53,912	2,944	27,002
1982	SAN JOAQUIN	984	304		30,590	2,318	

YEAR	COUNTY	GEESE			COOTS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	SAN JOAQUIN	2,156	1,372	10,682	490	196	735
1984	SAN JOAQUIN	3,312	1,476	13,068	5,004	540	3,096
1983	SAN JOAQUIN	3,450	1,656	15,778	5,842	552	3,082
1982	SAN JOAQUIN	4,142	1,178		2,926	380	

YEAR	COUNTY	WILD PIG		
		BAG	HUNTERS	DAYS
1985	SAN JOAQUIN	196	98	882
1984	SAN JOAQUIN	0	0	0
1983	SAN JOAQUIN	0	0	0
1982	SAN JOAQUIN	0	76	

YEAR	COUNTY	DOVES			CROW		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	STANISLAUS	54,194	3,920	18,767	4,361	686	3,577
1984	STANISLAUS	66,744	4,680	21,708	7,848	936	7,848
1983	STANISLAUS	61,962	4,738	18,492	9,706	920	3,128
1982	STANISLAUS	89,870	6,460				

YEAR	COUNTY	PHEASANT			QUAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	STANISLAUS	11,662	5,488	22,932	7,056	1,176	3,283
1984	STANISLAUS	21,996	8,064	36,612	11,232	1,440	5,580
1983	STANISLAUS	17,296	6,716	29,578	19,780	1,748	7,268
1982	STANISLAUS	25,270	8,094		11,286	2,204	

YEAR	COUNTY	JACKRABBIT			COTTONTAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	STANISLAUS	2,646	735	4,067	3,381	735	2,254
1984	STANISLAUS	7,884	1,548	8,856	4,968	1,044	6,120
1983	STANISLAUS	6,026	1,334	10,074	6,578	1,334	5,382
1982	STANISLAUS	9,424	1,748		9,398	1,786	

YEAR	COUNTY	TREE SQUIRREL			DUCKS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	STANISLAUS	1,421	343	1,862	23,618	2,205	14,210
1984	STANISLAUS	1,404	216	1,584	23,832	2,160	16,596
1983	STANISLAUS	690	460	1,702	21,206	1,702	15,548
1982	STANISLAUS	1,862	570		55,644	2,470	

YEAR	COUNTY	GEESE			COOTS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	STANISLAUS	1,862	735	6,517	2,450	294	1,421
1984	STANISLAUS	1,728	864	6,192	2,880	288	1,800
1983	STANISLAUS	782	736	6,302	736	184	1,104
1982	STANISLAUS	1,216	1,064		10,184	342	

YEAR	COUNTY	WILD PIG		
		BAG	HUNTERS	DAYS
1985	STANISLAUS	392	833	3,479
1984	STANISLAUS	504	540	2,268
1983	STANISLAUS	0	276	1,518
1982	STANISLAUS	76	226	

YEAR	COUNTY	DOVES			CROW		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MERCED	95,942	5,880	26,999	4,508	539	5,047
1984	MERCED	85,032	6,192	20,268	2,160	432	9,756
1983	MERCED	88,274	5,244	21,482	3,864	506	2,162
1982	MERCED	132,050	7,676				

YEAR	COUNTY	PHEASANT			QUAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MERCED	13,671	7,301	28,224	5,929	1,127	3,332
1984	MERCED	18,324	8,928	29,628	6,624	1,548	4,068
1983	MERCED	26,910	8,694	30,222	10,442	1,380	5,244
1982	MERCED	17,860	7,714	N.A.	12,388	1,520	N.A.

YEAR	COUNTY	JACKRABBIT			COTTONTAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MERCED	6,321	1,127	15,974	6,713	1,323	4,704
1984	MERCED	18,180	1,620	49,068	10,908	1,800	8,820
1983	MERCED	13,984	1,564	12,972	17,480	1,564	8,326
1982	MERCED	11,248	1,444	N.A.	12,806	1,824	N.A.

YEAR	COUNTY	TREE SQUIRREL			DUCKS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MERCED	1,176	294	1,029	242,501	10,486	92,561
1984	MERCED	0	36	36	221,328	11,952	88,452
1983	MERCED	644	230	552	262,062	11,178	99,084
1982	MERCED	4,674	950	N.A.	240,616	10,421	N.A.

YEAR	COUNTY	GEESE			COOTS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MERCED	19,159	4,851	50,127	9,163	686	2,646
1984	MERCED	4,932	3,708	23,112	6,552	1,260	4,356
1983	MERCED	19,550	3,910	30,130	18,170	1,472	7,636
1982	MERCED	5,586	3,230	N.A.	9,386	950	N.A.

YEAR	COUNTY	WILD PIG		
		BAG	HUNTERS	DAYS
1985	MERCED	343	637	1,764
1984	MERCED	288	756	2,268
1983	MERCED	1,058	414	2,668
1982	MERCED	152	532	N.A.

YEAR	COUNTY	DOVES			CROW		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MADERA	71,393	3,479	13,132	1,617	147	490
1984	MADERA	52,992	3,204	9,576	324	180	216
1983	MADERA	59,478	3,404	14,168	644	230	368
1982	MADERA	94,962	5,472				

YEAR	COUNTY	PHEASANT			QUAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MADERA	3,381	1,715	5,782	16,807	1,274	4,900
1984	MADERA	4,572	2,556	7,200	11,848	1,260	3,528
1983	MADERA	5,566	2,346	8,704	30,728	1,794	8,970
1982	MADERA	5,548	2,812		24,054	2,508	

YEAR	COUNTY	JACKRABBIT			COTTONTAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MADERA	9,947	490	22,001	6,370	490	11,417
1984	MADERA	5,112	828	4,464	5,472	936	4,572
1983	MADERA	6,348	920	4,508	5,290	1,242	12,052
1982	MADERA	8,588	988		6,726	1,558	

YEAR	COUNTY	TREE SQUIRREL			DUCKS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MADERA	3,430	686	5,145	9,702	784	3,479
1984	MADERA	2,412	684	8,172	4,428	504	1,728
1983	MADERA	2,576	966	4,048	21,022	874	8,786
1982	MADERA	3,496	1,406		4,256	608	

YEAR	COUNTY	GEESE			COOTS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	MADERA	343	294	784	0	0	0
1984	MADERA	180	72	216	1,080	72	216
1983	MADERA	414	230	2,438	230	92	184
1982	MADERA	266	152		190	76	

YEAR	COUNTY	WILD PIG		
		BAG	HUNTERS	DAYS
1985	MADERA	0	0	0
1984	MADERA	72	108	1,800
1983	MADERA	46	184	552
1982	MADERA	456	152	

YEAR	COUNTY	DOVES			CROW		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	FRESNO	176,988	10,045	39,690	5,782	686	3,626
1984	FRESNO	223,452	11,052	48,960	2,232	396	2,052
1983	FRESNO	255,852	10,718	58,144	1,794	322	1,288
1982	FRESNO	273,562	14,554	NOT AVAILABLE			

YEAR	COUNTY	PHEASANT			QUAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	FRESNO	7,301	5,341	19,208	27,930	4,312	14,945
1984	FRESNO	12,168	7,848	23,796	28,368	4,356	19,836
1983	FRESNO	18,952	7,452	27,738	56,718	5,520	22,448
1982	FRESNO	12,540	7,980		63,422	6,650	

YEAR	COUNTY	JACKRABBIT			COTTONTAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	FRESNO	12,838	1,470	6,664	13,573	2,254	7,644
1984	FRESNO	20,376	2,376	25,812	10,980	1,980	10,944
1983	FRESNO	18,584	2,668	16,790	18,952	2,530	13,800
1982	FRESNO	19,912	2,546		14,820	2,736	

YEAR	COUNTY	TREE SQUIRREL			DUCKS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	FRESNO	3,479	1,274	3,136	46,746	4,606	21,511
1984	FRESNO	7,704	1,404	8,388	60,768	5,544	32,076
1983	FRESNO	4,646	1,656	6,302	56,166	4,692	27,048
1982	FRESNO	8,512	2,850		52,820	4,560	

YEAR	COUNTY	GEESE			COOTS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	FRESNO	3,038	1,029	4,361	3,773	343	1,421
1984	FRESNO	216	756	3,024	5,040	540	2,160
1983	FRESNO	736	828	7,038	9,292	322	1,518
1982	FRESNO	798	912		3,762	532	

YEAR	COUNTY	WILD PIG		
		BAG	HUNTERS	DAYS
1985	FRESNO	1,470	2,548	13,622
1984	FRESNO	1,296	1,764	20,088
1983	FRESNO	644	1,886	11,178
1982	FRESNO	836	1,520	

YEAR	COUNTY	DOVES			CROW		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KINGS	48,167	2,793	10,241	0	0	0
1984	KINGS	62,100	3,060	9,900	468	72	468
1983	KINGS	93,104	3,726	19,320	2,208	184	1,886
1982	KINGS	66,804	3,686				

YEAR	COUNTY	PHEASANT			QUAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KINGS	2,842	1,764	5,929	4,165	490	1,372
1984	KINGS	3,456	2,196	6,264	4,896	612	2,844
1983	KINGS	5,152	2,530	9,338	9,476	966	4,416
1982	KINGS	3,192	2,128		9,158	456	

YEAR	COUNTY	JACKRABBIT			COTTONTAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KINGS	3,773	441	4,557	2,205	735	4,263
1984	KINGS	4,248	684	3,456	5,076	540	3,816
1983	KINGS	8,924	782	7,360	12,144	1,104	6,992
1982	KINGS	3,344	570		2,166	418	

YEAR	COUNTY	TREE SQUIRREL			DUCKS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KINGS	245	49	1,225	5,831	686	4,508
1984	KINGS	180	36	180	6,804	720	2,700
1983	KINGS	414	46	368	8,694	828	3,174
1982	KINGS	2,149	657		4,788	684	

YEAR	COUNTY	GEESE			COOTS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KINGS	196	294	735	784	98	588
1984	KINGS	144	396	1,332	2,052	216	828
1983	KINGS	0	46	460	5,336	230	782
1982	KINGS	912	266		2,090	76	

YEAR	COUNTY	WILD PIG		
		BAG	HUNTERS	DAYS
1985	KINGS	147	637	1,421
1984	KINGS	684	396	1,368
1983	KINGS	598	920	2,760
1982	KINGS	190	532	

YEAR	COUNTY	DOVES			CROW		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	TULARE	164,150	8,869	37,632	1,323	392	5,684
1984	TULARE	144,936	7,272	29,926	5,220	432	1,152
1983	TULARE	172,454	8,878	43,102	22,218	506	8,602
1982	TULARE	274,398	11,894				

YEAR	COUNTY	PHEASANT			QUAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	TULARE	7,105	5,341	18,816	23,520	3,234	10,437
1984	TULARE	8,712	5,184	15,696	30,240	2,916	9,612
1983	TULARE	12,282	5,842	20,010	39,192	3,956	20,562
1982	TULARE	9,082	6,612		57,570	4,408	

YEAR	COUNTY	JACKRABBIT			COTTONTAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	TULARE	7,350	1,666	6,811	7,840	1,813	6,664
1984	TULARE	8,136	1,116	6,516	10,872	1,584	8,928
1983	TULARE	21,114	1,748	25,300	17,848	1,794	17,526
1982	TULARE	32,452	2,318		16,264	2,356	

YEAR	COUNTY	TREE SQUIRREL			DUCKS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	TULARE	9,898	2,989	20,678	6,125	931	4,165
1984	TULARE	5,832	1,476	5,580	11,240	864	5,256
1983	TULARE	5,428	2,116	8,878	15,226	690	5,980
1982	TULARE	5,553	1,189		15,770	1,254	

YEAR	COUNTY	GEESE			COOTS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	TULARE	3,234	735	3,332	411	147	196
1984	TULARE	972	468	1,476	540	36	108
1983	TULARE	920	506	2,208	1,380	138	920
1982	TULARE	532	342		10,982	190	

YEAR	COUNTY	WILD PIG		
		BAG	HUNTERS	DAYS
1985	TULARE	539	588	3,381
1984	TULARE	900	612	4,824
1983	TULARE	414	782	3,864
1982	TULARE	608	684	

YEAR	COUNTY	DOVES			CROW		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KERN	320,460	16,317	62,769	3,332	588	2,254
1984	KERN	252,504	15,984	60,264	3,888	612	6,696
1983	KERN	302,634	16,376	76,636	2,208	414	2,346
1982	KERN	341,848	18,126				

YEAR	COUNTY	PHEASANT			QUAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KERN	6,860	4,165	12,691	112,063	10,829	47,775
1984	KERN	6,696	4,932	14,724	92,844	12,456	49,500
1983	KERN	12,558	5,934	19,642	138,506	12,880	598,000
1982	KERN	6,764	4,104		92,264	9,804	

YEAR	COUNTY	JACKRABBIT			COTTONTAIL		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KERN	84,084	5,880	42,728	45,962	6,566	34,741
1984	KERN	104,184	7,848	63,756	81,072	8,136	61,020
1983	KERN	111,780	7,498	66,930	56,672	8,740	51,566
1982	KERN	64,030	6,764		56,202	7,334	

YEAR	COUNTY	TREE SQUIRREL			DUCKS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KERN	18,522	3,577	13,867	44,933	3,381	17,101
1984	KERN	10,116	2,880	9,540	27,576	3,456	13,968
1983	KERN	14,490	2,944	13,984	58,696	4,002	30,360
1982	KERN	9,474	2,334		39,520	3,610	

YEAR	COUNTY	GEESE			COOTS		
		BAG	HUNTERS	DAYS	BAG	HUNTERS	DAYS
1985	KERN	1,960	686	4,214	14,112	441	4,067
1984	KERN	216	504	1,152	3,852	396	3,960
1983	KERN	690	782	5,566	2,714	506	5,888
1982	KERN	1,140	570		3,572	418	

YEAR	COUNTY	WILD PIG		
		BAG	HUNTERS	DAYS
1985	KERN	147	490	1,323
1984	KERN	72	216	792
1983	KERN	46	138	368
1982	KERN	0	114	

APPENDIX D.
COPY OF THE CALIFORNIA NONCONSUMPTIVE WILDLIFE USE SURVEY

APPENDIX D.

CALIFORNIA'S WILDLIFE

What Are Your Views?...

College of Agricultural and
Environmental Sciences
University of California, Davis

CALIFORNIA'S WILDLIFE AND YOU

You can help us determine the importance of wildlife to the people of California by answering these few short questions. Many important decisions facing California involve trade-offs between conserving our wildlife and activities such as timber harvesting, livestock grazing, irrigated agriculture and real estate developments. Your opinions will help inform State and Federal land managers about what you think is best for California!

WHAT DO WE MEAN BY THE WORDS WILDLIFE AND OUTDOOR RECREATION?

In this survey, the word WILDLIFE is meant to describe wild or undomesticated animals such as birds, squirrels, deer, fish, etc., NOT pets or farm animals. In this survey, the word, OUTDOOR RECREATION refers to pleasure trips taken to sightsee, picnic, camp, hike, fish, boat or hunt.

I. WILDLIFE AROUND WHERE YOU LIVE

Sometimes people enjoy seeing or hearing wild birds, squirrels and various wildlife while doing other activities in and around the home. For example, a person might enjoy the presence of birds while sitting on the porch or doing yard work. How about you?

1. During the past 12 months did you enjoy the opportunity to see or hear wildlife while doing other things in and around your home and yard? (Please circle one).

   a. YES b. NO

2. In the last 12 months have you enjoyed the opportunity to see or hear wild birds, squirrels and other wildlife while taking a walk, riding a bike or driving?

   a. YES b. NO

3. During the past 12 months did you visit any public parks or natural areas within one-mile of your home for the primary purpose of observing, feeding or photographing wildlife?

   a. YES b. NO

   3a. If YES, how often did you visit during these areas in the last 12 months? (Please check one)

   ☐ 1-5 times ☐ 6 or more times

II. THE VALUE OF VIEWING BIRDS

Many people enjoy seeing wild birds such as songbirds, waterfowl (ducks, geese), raptors (owls, hawks), shorebirds (sandpipers, killdeer), gulls, jays, etc., when participating in outdoor recreation activities. In these next few questions we want to find out your feelings about viewing these types of birds.

1. In the past 12 months, did you take any outdoor recreation trips in California that were at least one mile from your home?

   ______ YES (If YES go to Question #1a below)
   ______ NO (If NO go to Page 6, Question #12)

   1a. Did you see any birds on these outdoor recreation trips?

   ______ YES (If YES go to Question #2 below)
   ______ NO (If NO go to top of Page 5)

2. Please use the map of California in the middle of the questionnaire to identify the Map Area Number of the location of your **most recent outdoor recreation trip away from home where you saw wild birds.**

   ________ MAP AREA NUMBER ______________________________ City or County Name

3. How many trips did you make to *this Area* in the past 12 months? ______ #TRIPS

3a. How many of these trips were for the primary purpose of viewing wild birds? ______ #TRIPS

3b. For the trips listed above where viewing wild birds was **not** the primary purpose, how important was the presence of wild birds to your enjoyment of these outdoor recreation trips? (Check one)

☐ *Not important to my enjoyment*
☐ *Added to the overall trip enjoyment*
☐ *Was one of the highlights of the trip*

4. On the most recent trip to this Area where you saw wild birds, about how many birds (in total) did you see? (Please check one)

☐ 1-5 ☐ 6-10 ☐ 11-20 ☐ 21-50 ☐ 51-100 ☐ 100+

5. On your most recent trip to this Area where you saw wild birds, how many different types or species of birds did you see? ______ # OF DIFFERENT SPECIES

5a. Please check all of the different types of birds you saw.

☐ Songbirds ☐ Shorebirds ☐ Raptors ☐ Waterfowl ☐ Other

6. How far did you drive (one-way) to get to this Area from your home? ______ #MILES

7. How many people were in the vehicle?
______ # Adults ______ # children under 13 ______ # teenagers

8. What was the approximate cost to you in terms of transportation, food and lodging of this *most recent trip to this Area where you saw wild birds?* $__________

9. If your *annual* cost of visiting just this Area increased by $________ would you still visit this Area? (Please circle one)

a. YES b. NO

9a. What is the maximum increase in your annual expenses you would pay to continue visiting this Area?

$__________

9b. If your answer to 9a is more than zero, please go to Q #10.
If your answer to 9a is zero, please tell us why?
(Check one reason below and then go to Q #10).
☐ a. I do not receive any benefits from viewing birds
☐ b. I cannot afford to pay a higher trip cost
☐ c. Viewing birds is my right and it is unfair to expect me to pay

☐ d. Other: Please list reason ______________________________

10. Now imagine everything else about this Area was the same EXCEPT that you saw **twice as many types or species of wild birds** and your *annual* expenses for visiting this Area **increased** by $__________ . Would you incur the higher annual costs to see this greater number of bird species when visiting this Area?

a. YES b. NO

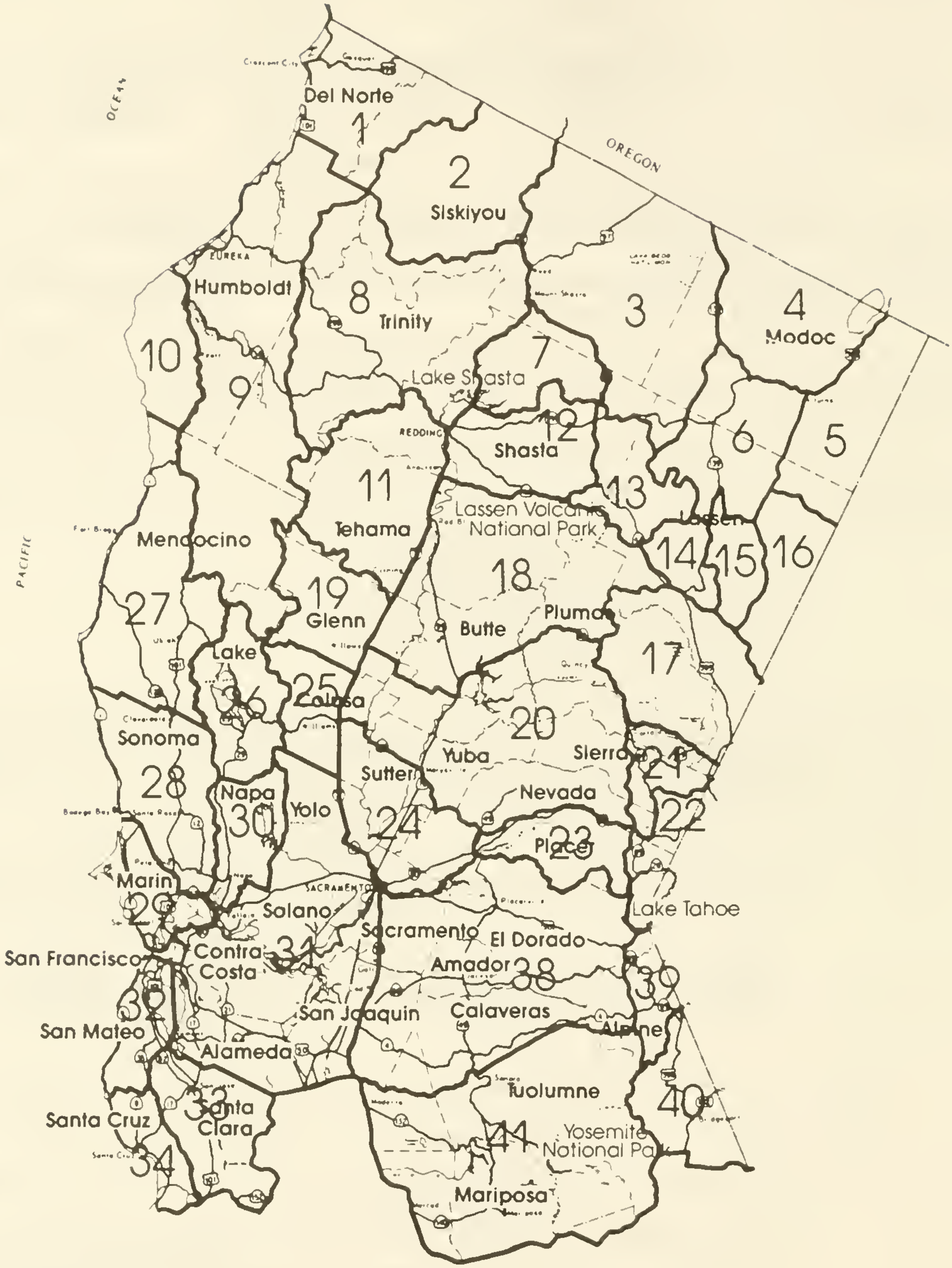
11. Please tell us about the other Areas in California you have visited in the past 12 months *where you have seen wild birds.* Use the Map to list Areas other than the one you described above.

MAP AREA NUMBER	CITY OR COUNTY NEAR MAP AREA	# OF TRIPS IN LAST 12 MONTHS	ONE WAY DISTANCE DRIVEN (Miles)	WAS VIEWING BIRDS THE PRIMARY PURPOSE OF TRIP	
				YES	NO

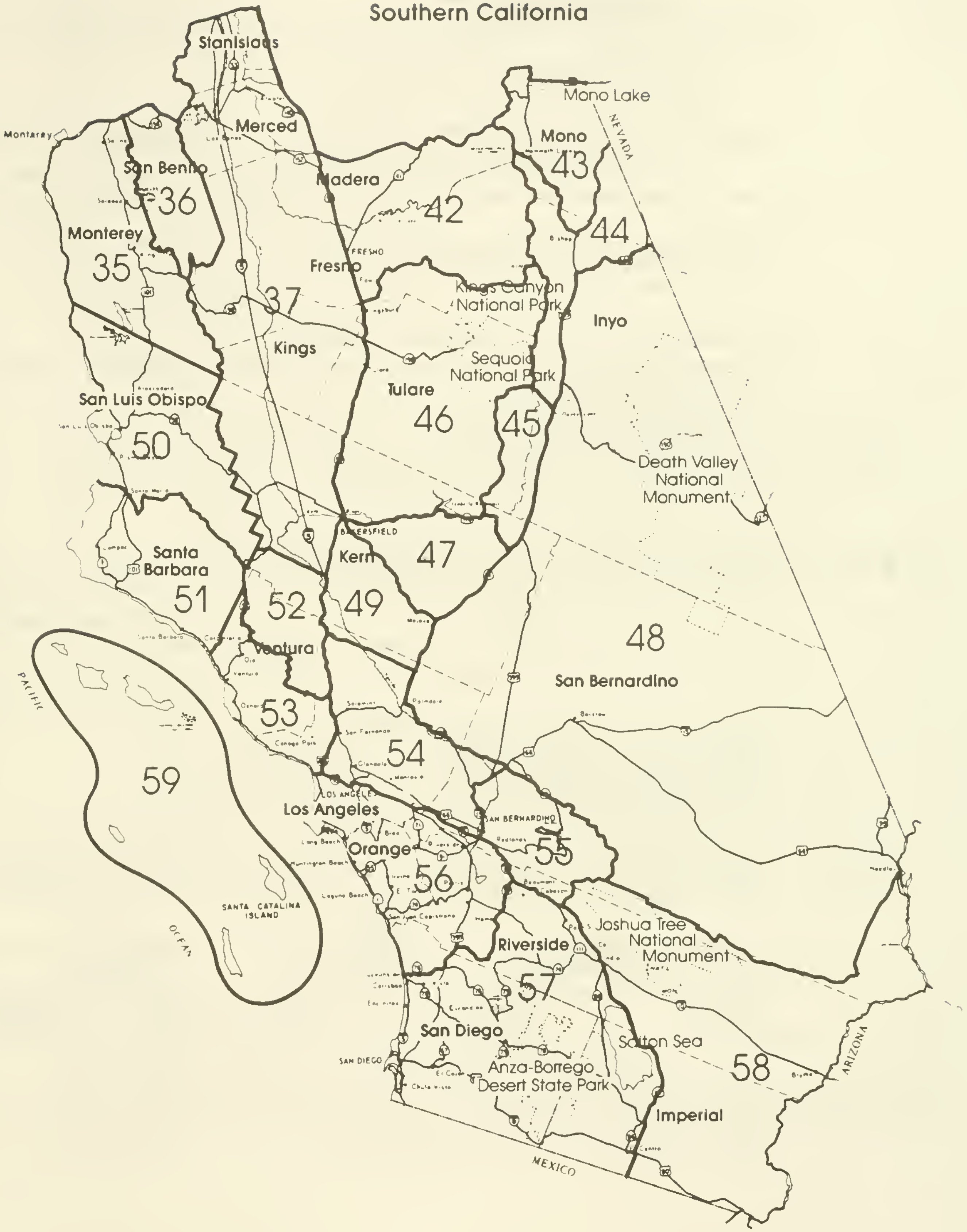
(Continue on the back of the questionnaire if more space needed)

12. When you choose places to visit does the potential for seeing wild birds influence where you go? (Circle one)
a. No Influence *b. Some Influence* *c. Strong Influence*

Northern California



Southern California



III. THE VALUE OF VIEWING DEER

Many people enjoy seeing deer when participating in outdoor recreation activities. In these next few questions we want to find out your feelings about viewing deer.

1. Did you see deer on any outdoor recreation trips you took in the last 12 months?
   ☐ YES (If YES go to Question #2)
   ☐ NO (If NO go to Q #1a below)

1a. If you did *not* see any deer on your trip, *please use the map in the middle of the questionnaire* and write down the Map Area Number of the place where you took your most recent outdoor recreation trip away from home during the past 12 months.

______ MAP AREA NUMBER ______________________ City or County Name

1b. What is the maximum increase in trip cost you would have spent to see a deer on a trip to this recreation area. $______
(Please GO to Question #11)

2. Please use the map of California in the middle of the questionnaire and write down the Map Area Number of the location of your **most recent outdoor recreation trip where you saw deer.**

______ MAP AREA NUMBER ______________________ City or County Name

3. How many trips did you make to this Area in the past 12 months? ______ #TRIPS

3a. How many of these trips were for the primary purpose of viewing deer? ______ #TRIPS

3b. For the trips listed above where viewing deer was **not** the primary purpose, how important was the presence of deer to your enjoyment of these trips? (Check one)
   ☐ *Not important to my enjoyment*
   ☐ *Added to the overall trip enjoyment*
   ☐ *Was one of the highlights of the trip*

4. How far did you drive (one-way) to get to this Area from your home? ______ #MILES

5. How many people were in the vehicle?
   ______ # Adults ______ # children under 13 ______ # teenagers

6. On your most recent trip to this Area when you saw deer, how many deer did you see?
   ______ #DEER

7. What was the approximate cost to you of this most recent trip to this Area for transportation, food and lodging? (if any)
   $______

8. If your *annual* cost of visiting just this Area increased by $______ would you still visit this Area? (Please circle one)

   a. YES b. NO

8a. What is the maximum increase in your annual expenses you would pay to continue visiting this Area?
   $______

8b. If your answer to 8a is more than zero, please go to Q #9.
If your answer to 8a is zero, please tell us why?
(Check one reason below and then go to Q #9)
☐ a. I do not receive any benefits from viewing deer
☐ b. I cannot afford to pay a higher trip cost
☐ c. Viewing deer is my right and it is unfair to expect me to pay

☐ d. Other: Please list reason ______________________

9. Now imagine everything else about this Area was the same EXCEPT that you saw **twice as many deer** and your *annual* expenses for visiting this Area **increased** by $______ . Would you incur the higher annual costs to see this greater number of deer when visiting this Area?

   a. YES b. NO

10. Please tell us about the other Areas in California where you have seen deer in the past 12 months. Use the Map to list Areas other than the one you described above.

MAP AREA NUMBER	CITY OR COUNTY NEAR MAP AREA	# OF TRIPS IN LAST 12 MONTHS	ONE WAY DISTANCE DRIVEN (Miles)	WAS VIEWING DEER THE PRIMARY PURPOSE OF TRIP YES	NO

(Continue on the back of the questionnaire if more space needed)

11. When you choose places to visit does the potential for seeing deer influence where you go? (Circle one)
a. No Influence *b. Some Influence* *c. Strong Influence*

12. Have you ever gone deer hunting in California? (Please circle one)

a. YES b. NO (If NO go to question #13)

If YES—Did you hunt deer in California during the 1986 season?

a. YES (If YES go to Q #14) b. NO (If NO go to Q #13)

13. Please tell us why you did not go deer hunting in California in 1986. (Please check one)
☐ I am not interested in hunting deer (Go to Question #14)
☐ I am interested in hunting deer but there are many reasons why I did not hunt deer in California during the 1986 season. (Please Answer the Question Below)

13a. What were the factors that prevented you from deer hunting in 1986? Check all the important reasons below.
☐ License fee too high
☐ Hunting application procedures too complex or rigid.
☐ Must apply too far in advance.
☐ I applied for but did not receive a permit.
☐ There are not enough deer.
☐ Lack information on places to hunt.
☐ Not enough publicly accessible deer hunting areas nearby.
☐ Other, Please Specify ____________________

14. The State of California is considering selling a Conservation Stamp/Pass that would generate funds for: (1) protection of wildlife habitat and (2) provision of interpretive programs at nine wildlife viewing areas including nature trails and visitor centers. Most of these areas would be located nearby California's major population centers. Would you buy a California Conservation Stamp/Pass that would provide you with free access to these nine wildlife areas, a collectable wildlife stamp and a year's subscription to California Outdoors magazine if it cost $________ each year? (Please circle one)

a. YES b. NO

THESE LAST FEW QUESTIONS WILL HELP US UNDERSTAND HOW WELL OUR SAMPLE REPRESENTS THE POPULATION OF CALIFORNIA. **YOUR ANSWERS WILL BE STRICTLY CONFIDENTIAL** AND WILL BE USED ONLY FOR STATISTICAL PURPOSES. YOU WILL NOT BE IDENTIFIED IN ANY WAY!

1. Are you: ☐ Male
☐ Female

2. What is your age? ______ YEARS

3. Are you a member of

a. a wildlife or environmental organization (such as Audubon Society, Sierra Club, etc.) ☐ YES ☐ NO

b. a hunting or fishing organization (Ducks Unlimited, Trout Unlimited, etc.) ☐ YES ☐ NO

4. Please circle the highest number of years of education you have completed.

1 2 3 4 5 6	7 8 9	10 11 12	13 14 15 16	17 18 19 20
Elementary	Jr. High	High School	College or Vocational	Graduate or Professional

5. To the best of your knowledge what was your household income (before taxes) in 1986?

☐ under $9999
☐ $10,000-14,999
☐ $15,000-19,999
☐ $20,000-24,999
☐ $25,000-29,999
☐ $30,000-34,999
☐ $35,000-39,999
☐ $40,000-49,999
☐ $50,000-59,999
☐ $60,000-74,999
☐ $75,000-99,999
☐ $100,000+

THANK YOU VERY MUCH FOR COMPLETING THIS SURVEY.
IF THERE IS ANYTHING ELSE YOU WOULD LIKE TO TELL US ABOUT WILDLIFE IN CALIFORNIA, PLEASE FEEL FREE TO WRITE ON THE BACK OF THE QUESTIONNAIRE.

Please put this survey in the enclosed postage paid return envelope and mail the survey to us. If you would like a copy of the study results write your name and address on a separate piece of paper and enclose it with your questionnaire. This will be immediately separated from the questionnaire to maintain confidentiality. The results will be available by December 1987.

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